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*biological and social*

A FIELD MUSEUM  
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Perú: Tapiche-Blanco









## *rapid biological and social inventories*

INFORME/REPORT NO. 27

### Perú: Tapiche-Blanco

Nigel Pitman, Corine Vriesendorp, Lelis Rivera Chávez, Tyana Wachter,  
Diana Alvira Reyes, Álvaro del Campo, Giuseppe Gagliardi-Urrutia, David Rivera  
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editores/editors

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Indígena Amazónico (CEDIA)



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la Amazonía Peruana (IIAP)



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Carátula/Cover: Los bosques entre los ríos Tapiche y Blanco  
albergan unas 17 especies de primates, incluyendo poblaciones  
grandes del huapito rojo, *Cacajao calvus* ssp. *ucayalii*, considerado  
Vulnerable en el ámbito mundial. Foto de Álvaro del Campo./  
The forests of Peru's Tapiche-Blanco region harbor some 17 species  
of primates, including large populations of the globally Vulnerable  
red uakari, *Cacajao calvus* ssp. *ucayalii*. Photo by Álvaro del Campo.

Carátula interior/Inner cover: Un mosaico de bosques de arena  
blanca, bosques de altura y vastos humedales estacionalmente  
inundables hace del interfluvio de Tapiche-Blanco una prioridad  
para la conservación en el Perú. Foto de Álvaro del Campo./  
With its striking mosaic of white-sand forests, upland forests, and  
vast seasonally flooded wetlands, the Tapiche-Blanco region is a  
leading conservation priority for Peru. Photo by Álvaro del Campo.

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### The Field Museum

The Field Museum is a research and educational institution with exhibits open to the public and collections that reflect the natural and cultural diversity of the world. Its work in science and education—exploring the past and present to shape a future rich with biological and cultural diversity—is organized in three centers that complement each other. The Gantz Family Collections Center oversees and safeguards more than 24 million objects available to researchers, educators, and citizen scientists; the Integrative Research Center pursues scientific inquiry based on its collections, maintains world-class research on evolution, life, and culture, and works across disciplines to tackle critical questions of our times; finally, the Keller Science Action Center puts its science and collections to work for conservation and cultural understanding. This center focuses on results on the ground, from the conservation of tropical forest expanses and restoration of nature in urban centers, to connections of people with their cultural heritage. Education is a central strategy of all three centers: they collaborate closely to bring museum science, collections, and action to its public.

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CEDIA is a Peruvian non-governmental organization with more than 32 years of experience working to benefit the indigenous peoples of Amazonian Peru. The tools we use include land titling, the legal defense of indigenous lands, joint management of protected areas, and the design and implementation of management plans for indigenous forests.

CEDIA has facilitated the land titling process for roughly 375 indigenous communities, representing more than 4 million hectares and 11,500 indigenous families. We are pioneers in designing and establishing Territorial Reserves for Indigenous Groups in Voluntary Isolation and Initial Contact, and have played a role in the creation of five protected areas and the categorization of three others.

CEDIA's strategy is to strengthen community organization and promote the conservation and sustainable use of natural resources on indigenous lands and in neighboring protected areas. Our work has benefitted the Machiguenga, Yine Yami, Ashaninka, Kakinte, Nanti, Nahua, Harakmbut, Urarina, Iquito, Matsés, Capanahua, Kokama kokamilla, Secoya, Huitoto, and Kichwa indigenous groups in the upper and lower Urubamba, Apurímac, Alto Madre de Dios, Chambira, Nanay, Gálvez, Yaquerana, Putumayo, Napo, Tigre, Blanco, Tapiche, and Bajo Ucayali watersheds in Amazonian Peru.

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The Instituto de Investigaciones de la Amazonía Peruana (IIAP) is a Peruvian government institution devoted to pure and applied research in Amazonia. It promotes sustainable resource use, biodiversity conservation, and human well-being in the region. IIAP's headquarters are in Iquitos, and it has offices in six other Amazonian regions. In addition to investigating the economic potential of promising species and developing methods to cultivate and manage natural resources, IIAP actively promotes activities aimed at the management and conservation of species and ecosystems, including the creation of protected areas; it also carries out the studies necessary to guide the creation of these areas. IIAP has six research programs: aquatic ecosystems and resources, terrestrial ecosystems and resources, ecological-economic zoning and environmental planning, Amazonian biodiversity, human diversity in the Amazon, and biodiversity databases.

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SERNANP is an agency of Peru's Ministry of the Environment established by Legislative Decree 1013 on 14 May 2008. Its charge is to provide the technical and administrative framework for the conservation of Peru's protected areas, and to ensure the long-term protection of the country's biological diversity. SERNANP oversees the country's protected areas network (SINANPE) and also provides the legal framework for protected areas established by regional and local governments, and by the owners of private conservation areas. SERNANP's mission is to manage the SINANPE network in an integral, ecosystem-based, participatory fashion, with the goal of sustaining its biological diversity and maintaining the ecosystem services it provides to society. Peru currently has 76 protected areas at the national level, as well as 17 regional conservation areas and 82 private conservation areas, and together these cover 17.25% of the country.

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SERFOR is an agency of Peru's Ministry of Agriculture and Irrigation charged with establishing forestry-related regulations, policy, guidelines, strategy, and programs, as part of its mission to ensure the sustainable management of the country's timber and wildlife.

SERFOR oversees the National System of Forestry and Wildlife Management (Sinafor) and sets Peruvian forestry policy. The agency works through its 13 Technical Forestry and Wildlife Administrative Offices (ATFFS) in Lima, Apurímac, Áncash, Arequipa, Cajamarca, Cusco, Lambayeque, Tumbes-Piura, Sierra Central, Selva Central, Puno, Moquegua-Tacna, and Ica.

The agency also works in close coordination with the nine regions that the national government has granted the responsibility of managing forestry and wildlife: Tumbes, Loreto, San Martín, Ucayali, Huánuco, Ayacucho, Madre de Dios, Amazonas, and La Libertad.

SERFOR values a participatory approach and aims for sustainable management that improves the wellbeing of Peru's citizens and advances the country's development. Peru has 73 million ha of forests accounting for more than 57% of its territory, and ranks as the second most forested country in Latin America and the ninth worldwide.

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The Herbario Amazonense (AMAZ) is located in Iquitos, Peru, and forms part of the Universidad Nacional de la Amazonía Peruana (UNAP). It was founded in 1972 as an educational and research collection focused on the flora of the Peruvian Amazon. In addition to housing collections from several countries, the collections showcase representative specimens of Peru's Amazonian flora, considered one of the most diverse floras on the planet. These collections serve as a valuable resource for understanding the classification, distribution, phenology, and habitat preferences of ferns, gymnosperms, and flowering plants. Local and international students, teachers, and researchers use these collections to teach, study, and identify plants, and in this way the Herbario Amazonense helps conserve Amazonia's diverse flora.

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Founded in 1918, the Museo de Historia Natural is the principal source of information on the Peruvian flora and fauna. Its permanent exhibits are visited each year by 50,000 students, while its scientific collections—housing a million and a half plant, bird, mammal, fish, amphibian, reptile, fossil, and mineral specimens—are an invaluable resource for hundreds of Peruvian and foreign researchers. The museum's mission is to be a center of conservation, education, and research on Peru's biodiversity, highlighting the fact that Peru is one of the most biologically diverse countries on the planet, and that its economic progress depends on the conservation and sustainable use of its natural riches. The museum is part of the Universidad Nacional Mayor de San Marcos, founded in 1551.

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**Centro de Ornitología y Biodiversidad (CORBIDI)**

The Center for Ornithology and Biodiversity (CORBIDI) was created in Lima in 2006 to help strengthen the natural sciences in Peru. The institution carries out scientific research, trains scientists, and facilitates other scientists' and institutions' research on Peruvian biodiversity. CORBIDI's mission is to encourage responsible conservation measures that help ensure the long-term preservation of Peru's extraordinary natural diversity. The organization also trains and provides support for Peruvian students in the natural sciences, and advises government and other institutions concerning policies related to the knowledge, conservation, and use of Peru's biodiversity. The institution currently has three divisions: ornithology, mammalogy, and herpetology.

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Our closest partner in this inventory was the Centro para el Desarrollo del Indígena Amazónico (CEDIA), whose vast experience and enthusiasm helped ensure that the rapid inventory was dynamic and successful. Lelis Rivera, Dani Rivera, David Rivera, Alberto Romero 'El Doc', Luis Trevejo, Rony Villanueva, Blanca Sandoval, Ronald Rodríguez, Melcy Rivera, Melissa González, Santos Chuncun, Argelio Rimachi Huanquiri, Ángel Valles Sandoval, and César Aquitari offered their support throughout the long process of the rapid inventory, from the first steps to the last presentation, and have continued their invaluable work in the forests and communities of the Tapiche-Blanco region since then.

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The social team thanks the excellent boat drivers who work closely with CEDIA. From the earliest preparatory stages of the inventory Santos Chuncun Bai Bëso, Luis Márquez Gómez, and Ángel Valles Sandoval demonstrated their expertise and years of experience with the often tricky Blanco and Tapiche rivers. Our profound thanks also to Luciano Cardoso Chuje and Ángel López Panduro, the communal leaders who participated as members of our social team during our visits to communities.

Reconnaissance overflights have become an indispensable tool for these rapid inventories. Having an eye in the sky gives us a broad understanding of the vegetation types in the study area, as well as a chance to 'visit' potential campsites before we have to choose. Our enormous thanks go to the personnel of the Peruvian Air Force, and especially to Orlando Soplin and the excellent

Twin Otter pilots, Donovan Ortega Diez and Julio Rivas Ego-Aguirre. Thanks to the skill and flexibility of the pilots, we had a very clear idea of the terrain before setting foot in the field.

Once again, the energetic collaboration of more than 40 residents of local communities was critical for establishing the three inventory campsites. In addition to clearing the helipads, preparing camping sites, and building canteens, work tables, storehouses, latrines, and bathing spots for the scientists, the *tigres* helped establish a network of ~70 km of trails that the biologists used during the inventory. The three cooks made sure that hungry workers were well-fed and happy after long days in the bush. Many of the *tigres* remained in camp or came back to provide support for the biological team, and others arrived to transport their colleagues back home. Here is the long list of community members who collaborated with us: Julio Cabudibo, Werlin Cabudibo, César Cachique, Erder Cananahuari, Antonio Chumo, Ernesto Chumo, Rolin Corales, Iris Culpano, Deivi Curichimba, Jorge Luis Da Silva, Jerson Del Águila, Luis Del Castillo, Henry Delgado, Luis Gómez, Esteban Gordon, Raúl Huaymacari, Cleider Icomena, Teófilo Lancha, Justino López, Gomer Macaya, Tomasa Macuyama, Ramón Manihuari, Manuel 'Chino' Márquez, Dainer Murayari, Jonathan Ochoa, Edwin Pacaya, Alexander Peña, Carlos Pezo, Kedvin Ramírez, Jesús Ricopa, Klever Ricopa, Milton Ricopa, Bernardo Saboya, Andy Sánchez, Melvin Suárez, Rosa Taricuarima, Helider Tenazoa G., Helider Tenazoa T., Celidoño Torres, Chairlon Tuanama, Séfora Ugarte, Damián Yaicate, and David Yumbato. Four residents of Wicungo and Monte Alegre could not take part in the advance work because their boat motor broke down on the way to Requena, but we are sure that they too would have done an excellent job.

The vast amount of work done by community members in these remote areas was carefully planned, coordinated, and implemented together with Field Museum and CEDIA staff, especially by the advance team leaders Álvaro del Campo, Guillermo Knell, and Italo Mesones, who had the unconditional support of Tony Mori, Luis Torres, and Magno Vásquez. To all of them, we express our profound thanks. Tony Mori deserves a special mention for his constant help with logistics in Iquitos and for keeping in close radio communication with the campsites. Likewise, our friend Helider Tenazoa Guerra was very effective in organizing the brigade from

the community of Monte Sinaí on the Tapiche River and helped maintain punctual radio communications with our second campsite.

For their help during the application process for the research permits we needed from Peru's National Wildlife and Forest Service (SERFOR) of the Ministry of Agriculture, we would like to thank Fabiola Muñoz Doderó, Karina Ramírez Cuadros, and Katherine Sarmiento Canales, who were key to ensuring we received those permits on time. We also thank the staff of the Regional Forestry Program offices in Iquitos and Requena for providing us a wealth of information about forestry during the lead-up to our inventory.

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We are deeply grateful to Nancy Portugal and Margarita Vara of the Ministry of Culture for sharing valuable information on the proposed Tapiche, Blanco, Yaquerana, Chobayacu, and tributaries (Yavarí Tapiche) Indigenous Reserve. We also thank Isrrail Aquisé Lizarbe of AIDESEP for sharing his experiences with indigenous groups living in voluntary isolation in the headwaters of the Tapiche and Blanco rivers.

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Before beginning the inventory, we organized a series of presentations at IIAP in Iquitos to give us an overview of forest management in Peru and to make sure the entire team was well informed about forestry activities in the study area. We are grateful for the excellent presentations delivered by Hugo Che Piu,

Robin Sears of CIFOR, and Gustavo Torres Vásquez of OSINFOR. We also acknowledge Ing. Keneth Reátegui del Águila, IIAP's president at that time, and Dr. Luis Campos Baca, IIAP's current president, and Guissepe Gagliardi-Urrutia for their help organizing the event, as well as Señor Juanito for preparing the auditorium.

Our beloved expedition cook deserves her own paragraph. Wilma Freitas once again managed to keep team spirits high during the three weeks of fieldwork. Wilma surprised even the most discerning palates with delicious dishes like *aji de gallina*, *arroz chaufa con cecina*, and *lomo saltado oriental*, with little more than a wood-fired stove in the middle of the forest. She even managed to work in the semi-flooded kitchen of our first campsite without losing her infectious good humor.

Trey Crouch of the geology team would like to thank María Rocío Waked for her help preparing him for the inventory and Andrés Erazo for loaning him a tent and other equipment. Special thanks to Teófilo Lancha, Andy Sánchez, and Alain Cárdenas for their help with field work at the Wiswincho camp; to Manuel (Chino) Márquez for his help sampling soils and water at the Anguila camp; and to César Cachique for the insights he provided on the hydrology of the Pobreza Creek and the Blanco River at the Quebrada Pobreza camp. Bob Stallard would like to thank Micki Kaplan for the gift of vacation time and pre-inventory support, and Sheila Murphy for help in pre-inventory preparation.

As seems fitting for the *scientia amabilis*, the botany team has many friends to thank. We are especially indebted to Tyana Wachter and Carlos Amasifuen, who made sure that our plant specimens began the long and laborious process of drying while we were still in the field; to Jorge Luis Da Silva, who made dozens of collections in our third tree plot; to the Amazon Tree Diversity Network and Hans ter Steege, who generated predictions about which tree species we would find during the inventory (from a laptop in Holland); to Paul Fine and Chris Baraloto, who shared data from their tree plots on the Blanco and Tapiche rivers; to Robin Foster, Juliana Philipp, and Tyana Wachter, whose dozens of photo guides to plants in Loreto helped us identify plants in the field; to Jon Markel and Mark Johnston, who analyzed satellite images of the Tapiche-Blanco region and made sense of the GPS points we brought back from the field; to Lelis Rivera and the social team for their work seeking out savanna vegetation in the region; to Crystal McMichael, who loaned us a soil auger and a

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Exporting hundreds of plant specimens is hard work. The plants we collected in Tapiche-Blanco were exported to Chicago in record time, largely thanks to the leadership of Marcos Ríos and to the invaluable help of Hamilton Beltrán, Patricia Velazco, María Isabel La Torre, and Severo Baldeón of the MHN-UNMSM, as well as that of herbarium director Dr. Haydeé Montoya Terreros. Renzo Teruya, Gaby Nuñez, and Isela Arce of SERFOR also played a crucial role in helping us obtain export permits. Thanks to Robin Foster, Nancy Hensold, Colleen Dennis, Tyana Wachter, Christine Niezgoda, Anna Balla, Mariana Ribeiro de Mendonça, and the Museum Collections Spending Fund for their help processing the rapid inventory plant specimens in the Field Museum herbarium.

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The mammal team gives special thanks to Dr. Patricia Álvarez-Loayza for her great work installing camera traps, which allowed us to record some rarely-spotted mammal species, and to Blgo. Rolando Aquino Yarihuamán for his help in identifying primate species. Thanks to Esteban Gordon Cauper, Damian Yaicate Saquiray, and Justino López González for their great help during the field work.

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When A&S was not available, Apache moved earth and sky so that we could contract an MI-17 helicopter from the Peruvian Air Force, under the invaluable leadership of Colonel César Alex Guerrero. The pilots' impeccable work gave our advance, biological, and social teams easy access to the study sites. Many thanks to Commander Colonel EP Roberto Espinoza EP, Co-Pilot Lt. EP Edwin Escobar Ishodes, Flight Engineer TCO3 EP Edwin Soncco Marroquín, and ALO Flight Engineer SO1 EP Ignacio Area Flores.

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We thank Ing. Keneth Reátegui del Águila, Dr. Luis Campos Baca, and Giuseppe Gagliardi-Urrutia for their generous invitation to use the IIAP auditorium for the presentation of our preliminary results in Iquitos. Likewise, we are indebted to Amelia Díaz Pabló and Luis Alfaro Lozano of Peru's National Weather and Hydrology Service (SENAMHI) for hosting our presentation of preliminary results in their auditorium in Lima. Melissa González helped organize and provide refreshments for the Lima presentation.

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We cannot imagine a rapid inventory that did not have the unconditional support of our beloved Tyana Wachter, whose magical positive stamina keeps everyone on the inventory safe and sound. It is supremely comforting to know that Tyana is always there, solving each and every problem, whether from Chicago, Lima, Iquitos, or Requena.

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This inventory was only possible thanks to the financial support of The Gordon and Betty Moore Foundation and The Field Museum.





The goal of rapid inventories — biological and social — is to catalyze effective action for conservation in threatened regions of high biological and cultural diversity and uniqueness

### Approach

**Rapid inventories** are expert surveys of the geology and biodiversity of remote forests, paired with social assessments that identify natural resource use, social organization, cultural strengths, and aspirations of local residents. After a short fieldwork period, the biological and social teams summarize their findings and develop integrated recommendations to protect the landscape and enhance the quality of life of local people.

**During rapid biological inventories** scientific teams focus on groups of organisms that indicate habitat type and condition and that can be surveyed quickly and accurately. These inventories do not attempt to produce an exhaustive list of species or higher taxa. Rather, the rapid surveys 1) identify the important biological communities in the site or region of interest, and 2) determine whether these communities are of outstanding quality and significance in a regional or global context.

**During social inventories** scientists and local communities collaborate to identify patterns of social organization, natural resource use, and opportunities for capacity building. The teams use participant observation and semi-structured interviews to quickly evaluate the assets of these communities that can serve as points of engagement for long-term participation in conservation.

**In-country scientists** are central to the field teams. The experience of local experts is crucial for understanding areas with little or no history of scientific exploration. After the inventories, protection of natural communities and engagement of social networks rely on initiatives from host-country scientists and conservationists.

Once these rapid inventories have been completed (typically within a month), the teams relay the survey information to regional and national decision-makers who set priorities and guide conservation action in the host country.

## REPORT AT A GLANCE

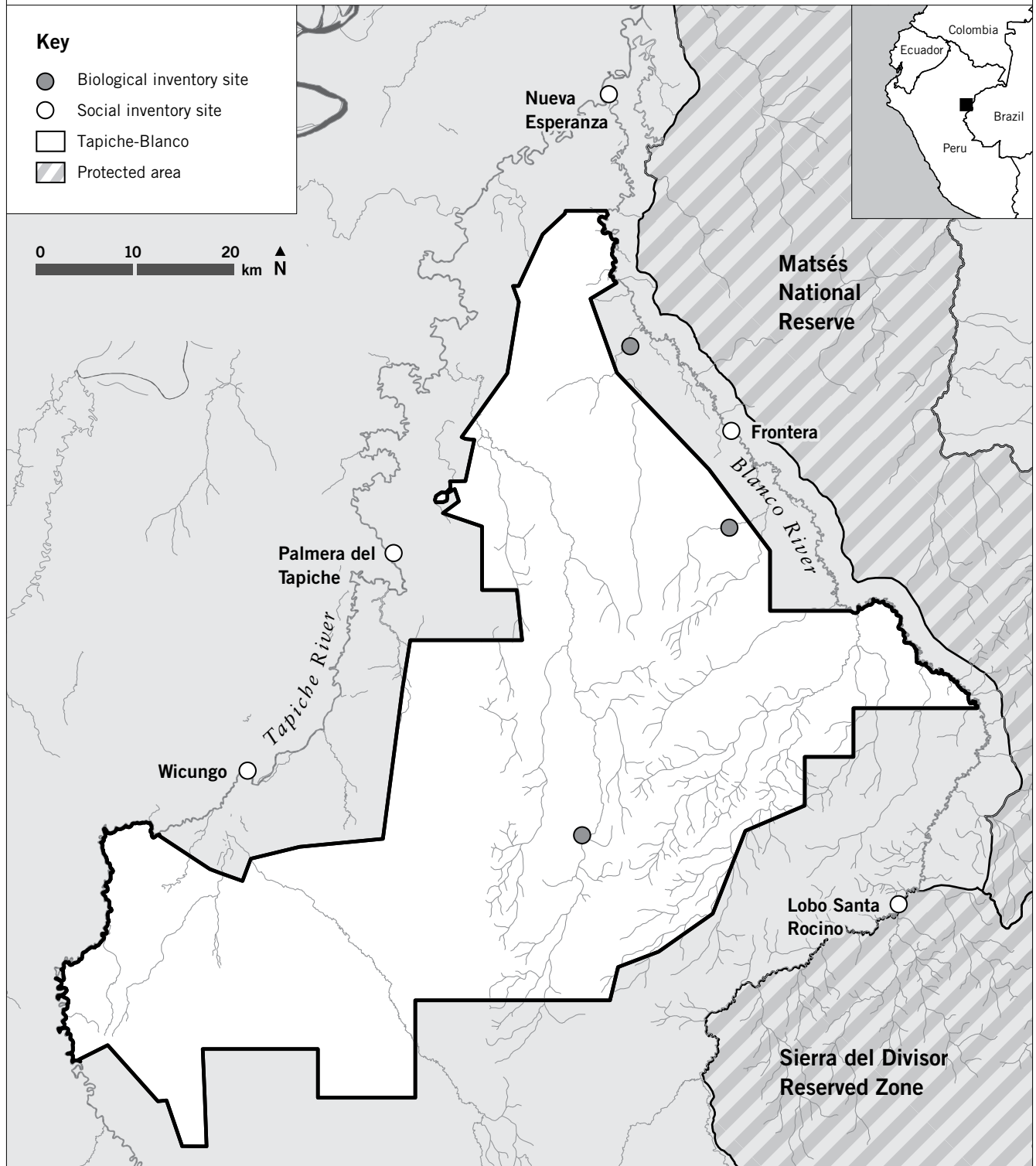
Dates of  
fieldwork

9–26 October 2014

### Key

- Biological inventory site
- Social inventory site
- Tapiche-Blanco
- ▨ Protected area

0 10 20 km N



## REPORT AT A GLANCE

### Region

The Tapiche River is an east-bank tributary of the Ucayali that drains a large expanse of lowland Amazonian forest in Peru's southern Loreto Region. During the rapid inventory we visited seven sites in a ~310,000-ha area between the Tapiche and its largest tributary, the Blanco. Part of the ancestral territory of the Capanahua and Matsés indigenous peoples, this is roadless wilderness that acts as a forest corridor between two adjacent protected areas (see map). However, years of logging, hunting, and oil exploration have left a conspicuous legacy of logging trails, scattered tree stumps, and seismic lines. Active logging and hydrocarbon concessions occupy much of the study area. There are currently 23 *campesino* communities, indigenous communities, and other settlements along the Tapiche and Blanco rivers, with a total population of ~2,900 *mestizo*, Capanahua, and Kichwa residents.

### Sites visited

#### Campsites visited by the biological team:

Blanco watershed	Wiswincho (Quebrada Yanayacu/Blanco)	9–14 October 2014
	Quebrada Pobreza	20–26 October 2014
Tapiche watershed	Anguila (Quebrada Yanayacu/Tapiche)	14–20 October 2014

#### Sites visited by the social team:

Blanco watershed	Comunidad Nativa Lobo Santa Rocino	9–13 October 2014
	Comunidad Nativa Frontera	20–25 October 2014
Tapiche watershed	Comunidad Nativa Wicungo	13–17 October 2014
	Comunidad Nativa Palmera del Tapiche	17–20 October 2014

During the inventory the social team also met with residents of several other communities: España, Nuestra Señora de Fátima, Monte Alegre, Morales Bermúdez, Pacasmayo, Puerto Ángel, San Antonio de Fortaleza, San Pedro, and Yarina Frontera Topal.

The day after fieldwork concluded, on 26 October 2014, the social and biological teams met in the community of Nueva Esperanza to share preliminary results of the inventory with authorities and residents of the Blanco and Tapiche watersheds. On 28–29 October, both teams held a workshop in Iquitos to identify the main threats, assets, and opportunities in the region and to draft conservation recommendations.

### Biological and geological inventory focus

Geomorphology, stratigraphy, hydrology, and soils; vegetation and flora; fishes; amphibians and reptiles; birds; large and medium-sized mammals; bats

**Social inventory focus**

Social and cultural assets; ethnohistory; demography, economics, and natural resource management systems; ethnobotany

**Principal biological results**

The Tapiche-Blanco region epitomizes Loreto's extraordinary landscape diversity. It harbors large expanses of wetlands and peatland forests, white-sand forests, and hyperdiverse upland forests, and these are drained by a variety of black, white, and clearwater streams. Located within the global epicenter of amphibian, mammal, and bird diversity, and highlighted by recent maps as possessing the largest aboveground carbon stocks in Peru, the region has maintained continuous forest and a high conservation value despite a long history of unregulated logging, hunting, and fishing. The region has long been a conservation priority of the national and regional governments, and the high plant and animal diversity we recorded during the inventory make it clear that it deserves the designation.

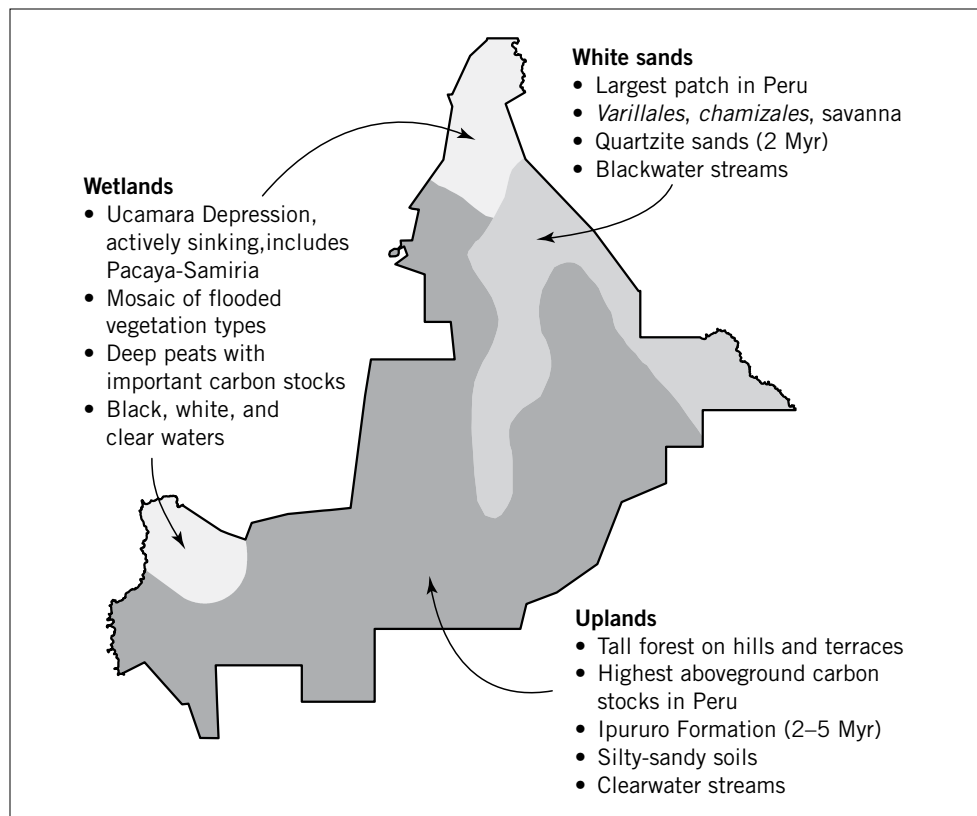
**We recorded 962 plant species and 741 vertebrate species during the inventory.**

Dozens of the species we recorded are distributed patchily in Amazonian Peru because they specialize on 'islands' of poor-soil vegetation. Based on our fieldwork and on maps of diversity in these groups, we estimate that the total number of vascular plant and vertebrate species in the Tapiche-Blanco region is 3,878–4,478.

	Species recorded during the inventory	Species estimated for the region
Vascular plants	962	2,500–3,000
Fishes	180	400–500
Amphibians	65	124
Reptiles	48	100
Birds	394	550
Large and medium-sized mammals	42	101
Bats	12	103
<b>Total</b>	<b>1,703</b>	<b>3,878–4,478</b>



### Landscape elements



Although tremendously complex at small scales, the landscape is composed of three main elements. In the north, where the Tapiche and Blanco rivers meet, a mostly flooded expanse in the Ucamara Depression harbors large wetlands (~100 m above sea level). In the east, a strip of white-sand soils and associated stunted forest (*varillales* and *chamizales*) borders the Blanco River (100–125 masl). The remainder of the region is dominated by upland hills and terraces (125–180 masl).

### Geology, hydrology, and soils

The Blanco and Tapiche are low-conductivity nutrient-poor whitewater rivers. The geological formations they drain correspond broadly to the three main landscape elements described above. Recent alluvial sediments and peats underlie the flooded areas, which are located within the same slowly subsiding Ucamara Depression as the vast Pacaya-Samiria wetlands farther north. Plio-Pleistocene quartz sand deposits (~2 million years old) underlie the stunted *varillal* and *chamizal*. Finally, the slightly older Ipururo Formation (2–5 million years old) occupies most of the uplands.

Soils derived from all three geological formations tend to be sandy, nutrient-poor, and covered with a dense root mat whose thickness ranges from 5–15 cm on the slightly richer upland soils to 10–30 cm on the poorer white sands and peat. The yellow-brown loamy sand and sandy loam upland soils of the Ipururo Formation are drained by clearwater

streams with very low conductivities (<10 µS/cm) and a slightly acidic pH. The white quartz-sand soils in the *varillales* and *chamizales* are drained by blackwater, higher-conductivity (30–50 µS/cm) and acidic (pH <4.5) streams. Water bodies in the flooded areas are a mix of white, black, and clearwater. Salt licks (*collpas*) are relatively rare in the region, but are important attractions for terrestrial mammals and hunters. A parrot *collpa* of a type rarely recorded in Loreto was observed on a cliff along the Blanco River.

This is one of the most geologically active regions of the Loreto lowlands, crisscrossed by deep and shallow faults. The most notable is the Bolognesi Fault, whose role in elevating the uplands above the white-sand forests west of the Blanco River makes it conspicuous on satellite images. The Blanco River itself appears to be developed along a zone of secondary faulting, which likely led to the Blanco's geologically recent 'capture' of headwaters that previously belonged to the Gálvez River.

The region's sandy, low-nutrient soils make it especially vulnerable to large-scale extractive activities. The root mats that currently protect the soil are easily destroyed by road-building, deforestation, and intensive forestry. Loss of these root mats would result in excessive upland erosion and the subsequent burial of important wetland environments and low-lying *varillales* and *chamizales*. While the three oil wells drilled to date in the region were dry, exploration is ongoing and constitutes a grave risk. Drilling in the Tapiche-Blanco region could cause spills of salty formation waters or oil that could pollute surface waters and aquatic ecosystems, an especially grave concern given the exceedingly low levels of salts in the landscape.

## Vegetation

Three large blocks of vegetation dominate the landscape: wetlands, white-sand forests, and upland forests (see map above). Within these blocks we recorded a complex mosaic of at least five vegetation types (and eight sub-types), many of them growing on nutrient-poor soils and featuring plant species that are poor-soil specialists.

Some poor-soil forests in the region grow on white sands and others grow on peat deposits. The *varillal* and *chamizal* forests on white sand are very similar in structure and composition to those in the Matsés and Allpahuayo-Mishana National Reserves, but are dominated by different species. We also found forests that strongly resemble *varillales* and that harbor a number of species typically associated with that forest type (*Pachira brevipes*, *Macrolobium microcalyx*, *Pagamea*, *Platycarpum* sp. nov.), but that grow on peat. These vegetation types, which we are calling peatland *varillales* and *chamizales*, are similar to Loreto's iconic white-sand forests, but their canopies are overtopped by scattered emergent *Mauritia flexuosa* and *Mauritiella armata* palms.

We also found a third vegetation type on peat that was open, dominated by knee-high sedges, and resembled a savanna. Known from very few other sites in Loreto, peatland savannas like this occupy tiny patches on the Tapiche-Blanco landscape but likely harbor

## REPORT AT A GLANCE

### Vegetation (continued)

plant and animal specialists and deserve more study.

The highest elevations on the landscape are occupied by majestic, closed-canopy upland forests with hyperdiverse tree communities that are compositionally similar to those in Jenaro Herrera, the Matsés National Reserve, and the Yavarí watershed. These upland forests were the most heavily disturbed vegetation type. We saw a large number of cut stumps and timber extraction trails left by illegal loggers, and the forest was also crisscrossed by recently cut seismic lines.

### Flora

The botanists collected 1,069 vascular plant specimens and identified but did not collect another ~200 species in the field, for a total of 962 species recorded during the inventory. We believe the regional flora contains 2,500–3,000 vascular plant species.

The palm community was especially diverse. We recorded 19 genera and 36 species, including some that are rarely sighted in Loreto, such as *Oenocarpus balickii* and *Syagrus smithii*. We also found an undescribed species of *Platycarpum*, as well as four new records for Peru (the herb *Monotagma densiflorum*, the orchids *Palmorchis sobralioides* and *Galeandra styllomisantha*, and the treelet *Retiniphyllum chloranthum*).

The results of our tree inventories are similar to those of recent forestry surveys in the region. Six families—Fabaceae, Arecaceae, Sapotaceae, Chrysobalanaceae, Lauraceae, and Myristicaceae—account for more than half of all stems and contribute the largest number of species and all of the most common species. In the 70 km of trails we explored and the ~1,800 trees we inventoried we found none of the highest-value timber species, tropical cedar (*Cedrela odorata*) or mahogany (*Swietenia macrophylla*). We only found three *Cedrelinga cateniformis* trees (a second-tier high-value species), and all of them had been cut down.

### Fishes

Fish communities in the aquatic habitats of the Tapiche and Blanco watersheds are very diverse. During the 14-day inventory we recorded 180 species in 22 sampling stations, and the social team recorded another 30 in their visits to communities. Most sampling stations were blackwater streams and most of the species we recorded are adapted to those nutrient-poor habitats. We estimate that the Tapiche and Blanco watersheds harbor a fish fauna of 400–500 species—roughly 40% of all freshwater fish known from Peru.

Among the species recorded during the inventory are four that appear to be new to Peru or new to science (species in the genera *Hemigrammus*, *Tyttocharax*, *Characidium*, and *Bunocephalus*).

A quarter of the species we recorded were also recorded during the rapid inventory of the Sierra del Divisor Reserved Zone; comparable numbers for the lower Tapiche River and the Matsés National Reserve are 22% and 7%. Half of the species in our list were not recorded in those three earlier inventories.

	<p>Roughly half of the fish species we recorded are used in some way by local residents. Many are ornamental taxa that are sold to collectors in Peru and around the world (<i>Osteoglossum bicirrhosum</i>, <i>Hyphessobrycon</i> spp., <i>Hemigrammus</i> spp., <i>Corydoras</i> spp., <i>Apistogramma</i> spp., and <i>Gymnotus</i> spp.), and Peruvian fishing statistics show the Tapiche and Blanco watersheds to be important areas for ornamental fish (DIREPRO 2013). Other species are fished and eaten by local communities, especially migratory taxa like <i>sábalos</i> (<i>Brycon</i>, <i>Salminus</i>), <i>sardinas</i> (<i>Triportheus</i>), <i>lisas</i> (<i>Leporinus</i>, <i>Schizodon</i>), <i>boquichicos</i> (<i>Prochilodus</i>, <i>Semaprochilodus</i>), and large catfishes (<i>Pseudoplatystoma</i>, <i>Brachyplatystoma</i>). The Amazon's largest food fish, arapaima (<i>Arapaima</i> spp.), is also reported to be present.</p>
<b>Amphibians and reptiles</b>	<p>The herpetologists sampled terrestrial and aquatic habitats in upland, flooded, and white-sand forests, and found well-preserved amphibian and reptile communities. We recorded 113 species (65 amphibians and 48 reptiles) during the inventory and estimate that the region has a herpetofauna of at least 124 amphibians and 100 reptiles. These are astronomic but not unexpected numbers, given that the region lies within the global epicenter of amphibian diversity.</p> <p>Notable records include the poison dart frog <i>Ranitomeya cyanovittata</i>, which is restricted to southern Loreto. Four frog species we found in the inventory may be new to science: <i>Hypsiboas</i> aff. <i>cinerascens</i>, <i>Osteocephalus</i> aff. <i>planiceps</i>, <i>Chiasmocleis</i> sp. nov., and <i>Pristimantis</i> aff. <i>lacrimosus</i>. We also recorded two globally Vulnerable species: yellow-footed tortoise (<i>Chelonoidis denticulata</i>) and yellow-spotted river turtle (<i>Podocnemis unifilis</i>, also considered Vulnerable in Peru).</p>
<b>Birds</b>	<p>We observed 394 bird species in the campsites we visited. This number is intermediate between those recorded in the rapid inventories of the Matsés National Reserve (416) and the Sierra del Divisor Reserved Zone (365). When records from previous expeditions to the Tapiche and Blanco watersheds are included, the total number of bird species recorded to date in these watersheds is 501. We estimate a regional avifauna of 550 species.</p> <p>The most striking records are the 23 birds that are specialists on poor-soil forests. These include <i>Notharchus ordii</i>, <i>Hemitriccus minimus</i>, and <i>Myrmotherula cherriei</i>. We made a concerted search for the three poor-soil specialists that are endemic to Loreto or to Peru (<i>Percnostola arenarum</i>, <i>Polioptila clementsii</i>, and <i>Zimmerius villarejoi</i>), but none were recorded during the inventory.</p> <p>More than 15 of the species we recorded represent range extensions. While some of these reflect the lack of previous bird studies in the region, most are birds whose restricted or disjunct distributions are associated with patches of poor-soil forests. Four examples are <i>Nyctibius leucopterus</i> (previously known only from a few localities north of the Ucayali-Marañón confluence; Fig. 9A), <i>Myrmotherula cherriei</i> (known only from</p>

## REPORT AT A GLANCE

### Birds (continued)

the lower Tigre River, Loreto; Fig. 9F), *Xenopipo atronitens* (known from the middle Marañón, Loreto, and the Pampas del Heath, Madre de Dios; Fig. 9B), and *Polytmus theresiae* (known from Morona, Jeberos, and the Pampas del Heath). Other range extensions are of species that are associated with floodplains along large rivers, such as *Capito aurovirens* and *Myrmoborus melanurus*.

Game bird populations were modest and mostly represented by a few sightings of *Penelope jacquacu*, *Mitu tuberosum*, and *Psophia leucoptera*. It is possible that these populations are depressed by hunting, but it is also possible that they reflect the poor soils and low-productivity habitats that dominate the region. The Tapiche-Blanco region harbors at least 70 bird species that deserve special conservation attention: three globally Vulnerable species, two species that are considered Vulnerable in Peru, and a large number of species listed in CITES appendices.

### Mammals

We censused mammals during the inventory by walking transects (large and medium-sized mammals) and setting mist nets (bats). Of the 204 mammals estimated to occur in the region (101 large and medium-sized mammals and 103 bats) we recorded 54 (42 and 12). Maps of global mammal diversity show the Tapiche-Blanco to be part of the world's most diverse region.

Primates were especially diverse. The 13 species we recorded during the inventory and the 4 additional species that are expected for the region or that have been recorded on previous work represent more than half of all primate species in Loreto. In Peru, the saddleback tamarin (*Saguinus fuscicollis*) is only found between the Tapiche and Blanco rivers. At our Blanco River campsites we found healthy populations of the globally Vulnerable red uakari (*Cacajao calvus*). At the Anguila campsite we sighted an unidentified *Callicebus* that may prove to be an undescribed species. Overall we recorded 15 globally or nationally threatened mammal species.

Ungulate populations were low at the sites we visited, and this was especially true of white-lipped peccary (*Tayassu pecari*). This may reflect the impacts of hunting around logging camps. However, we also heard reports of healthy animal populations near some communities, where residents hunt for food and occasionally to sell bushmeat. This uncertainty regarding the populations of game mammals in the region makes it a high priority to establish agreements between communities and loggers regarding the monitoring and sustainable management of game.

### Human communities

The Tapiche and Blanco watersheds are home to roughly 2,900 people in 22 settlements—indigenous communities, *campesino* communities, and other settlements—most of which are currently seeking official recognition and land titles. These are mostly *mestizo* communities settled by immigrants from cities like Requena and Iquitos, neighboring watersheds like the Ucayali, Tigre, and Marañón, and other regions of Peru like San Martín.

The region forms part of the ancestral territory of the Capanahua indigenous group. The Remo (another group in the Pano linguistic family) and the Matsés also used these watersheds historically. The arrival of outside colonists began during the rubber boom (ca. 1900), after which the Capanahua were gradually pushed south, towards the upper Tapiche, and the Matsés pushed east, to the Yaquerana and Gálvez watersheds.

The regional economy is diversified and dynamic and has strong connections to markets. The primary economic activities are logging, ornamental fish collection, fishing, hunting, subsistence agriculture, and the sale of plantains and manioc byproducts (*fariña* and tapioca) in the nearby towns of Requena, Curinga, and Santa Elena. These economic activities have driven settlement patterns and created most communities in the region. This work requires a deep knowledge of the regional ecology, natural resources, and seasonal patterns, and has forged strong connections between local residents and their natural surroundings.

Logging is carried out under a number of different methods—including community forests (*bosques locales*), forestry permits (*permisos forestales*), concessions, and illegal logging in unauthorized areas—and it involves a large array of local and external actors. Debt peonage remains common, and has left many local residents and communities in debt and subject to abusive working conditions. Residents who fish for a living are somewhat freer from these pressures but also dependent to the same degree on the market.

Across this social landscape new leaders have begun to emerge and an increasing number of municipal posts are occupied by local residents. Community assemblies are increasingly used as places to develop agreements between communities regarding how communities work, organize themselves, and harvest natural resources. Relationships between communities are good, and this represents an important foundation for sustainable management of the region. The presence of government agencies like the park service (SERNANP), which has staff in the region managing the Matsés National Reserve and the Sierra del Divisor Reserved Zone; the Tapiche Reserve, an ecotourism lodge and private conservation initiative; and NGOs like the Centro para el Desarrollo del Indígena Amazónico (CEDIA) are important potential players in helping strengthen local initiatives to replace the current model of natural resource use with new systems that are fairer and more sustainable.

#### **Current status**

The Tapiche-Blanco region is designated as a conservation priority in the master plan of the Peruvian park system (SERNANP 2009), which shows the region as a key link in a corridor connecting Sierra del Divisor Reserved Zone with Matsés National Reserve. The Tapiche-Blanco interfluvium is also considered a conservation priority by the Loreto regional government (PROCREL 2009). Part of the area has also been proposed as the Yavarí-Tapiche Territorial Reserve, intended to protect uncontacted indigenous peoples. However,

## REPORT AT A GLANCE

### Current status (continued)

the only conservation area established in the region to date is a small private initiative near the confluence of the Blanco and Tapiche rivers: the Tapiche Reserve (1,500 ha).

Most of the region has been designated for forestry (as Bosque de Producción Permanente)—including large expanses of stunted white-sand forest that has no potential for forestry—but the highest-value timber species have already been removed. There are several forestry concessions in the region, but many of these have been cancelled in recent years. Forestry operations inside communities are also active, and illegal and informal logging remains common throughout the region.

There are three oil and gas concessions in the region. Over the last two years the Pacific Rubiales company has opened dozens of seismic lines in the southern portion of the study area.

### Conservation targets

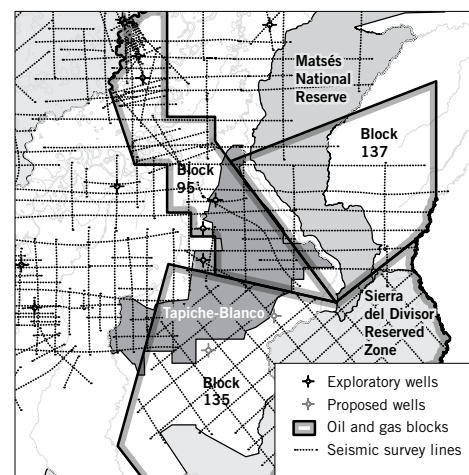
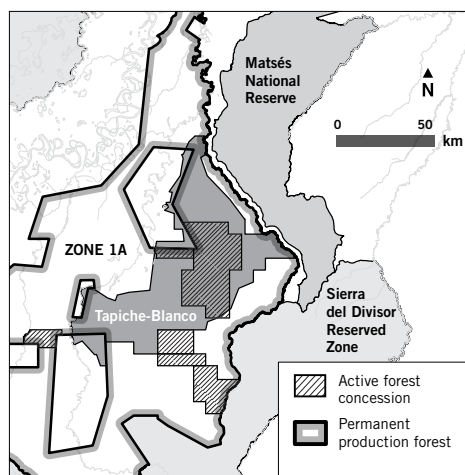
- 01 The largest patch of white-sand vegetation in Peru (~18,000 ha), as well as savannas that are poorly known and exceedingly rare within Loreto
- 02 Upland forests estimated to contain the highest carbon stocks in Peru
- 03 Fragile soils and blackwater aquatic communities that would be destroyed by deforestation and road-building
- 04 Hyperdiverse plant and animal communities, including globally and nationally threatened species and species with restricted ranges
- 05 A primate community with up to 17 species—more than half of all primate species in Loreto
- 06 Fish species that are economically important for local communities

### Principal assets for conservation

- 01 Forests and rivers that have maintained their high conservation value despite years of high-grading, and that still constitute important corridors between adjacent protected areas
- 02 Tools for community management of the landscape, including life plans (*planes de vida*) being developed by most communities in the region
- 03 Strong interest among local residents in fair and environmentally sensitive work, such as sustainable fishing
- 04 The presence in the area of several stakeholders with experience in conservation and the sustainable use of natural resources (SERNANP, CEDIA, Tapiche Reserve)
- 05 Peru's new forestry law, which offers the government an opportunity to address the most problematic aspects of Amazonian timber production

## Main threats

- 01 Logging operations that are illegal, informal, or leave lasting scars on social and biological communities
- 02 Existing and proposed roads for extracting timber
- 03 Little to no oversight of natural resource harvests by all actors on the landscape
- 04 A social landscape marked by unclear land tenure, corruption, and a negligible presence of public officials
- 05 Active hydrocarbon exploration in a tectonically active region where oil and gas production poses steep pollution risks



## Principal recommendations

- 01 Complete the land titling process in all communities and settlements in the region
- 02 Create a 308,463-ha protected area between the Tapiche and Blanco rivers for conservation and sustainable natural resource use (Figs. 2A–B)
- 03 Redraw the boundaries of lands currently designated for forestry (Zone 1A) to eliminate overlap with the proposed conservation area, since the poor, fragile soils make sustainable, low-impact logging operations impossible
- 04 Work closely with communities and authorities to ensure effective participative management of community lands, neighboring protected areas, and other conservation initiatives
- 05 Take joint action between government authorities and local communities to eliminate illegal logging in the Tapiche and Blanco watersheds



## Why Tapiche-Blanco?

In July 2014 researchers mapping aboveground carbon stocks throughout Peru announced two striking discoveries: Amazonian forests in the Loreto region hold most of Peru's carbon, and the highest carbon stocks in Peru occur in forests along the Loreto-Brazil border (Asner et al. 2014).

Two months later our team dropped into this carbon hotspot to assess conservation opportunities there. Our focus was a ~310,000-ha landscape between the Tapiche and Blanco rivers (Fig. 2), an expanse of lowland forest that forms a natural corridor between two protected areas: Matsés National Reserve to the east and Sierra del Divisor Reserved Zone to the south.

From previous inventories in those areas we knew that the Tapiche-Blanco region harbors the largest tract of white-sand soils in Peru—18,000-ha of unique stunted forest (*varillales* and *chamizales*) along the left bank of the Blanco—adjacent to a vast wetland and an even larger expanse of megadiverse upland forests. But our pre-inventory meetings with communities also revealed a region in the grip of unsustainable extractive industries: illegal logging, hydrocarbon concessions, and unregulated hunting.

Our field work revealed an opportunity to consolidate a major conservation corridor in the Loreto carbon hotspot. During the three-week inventory our team discovered a mind-boggling array of stunted vegetation types on white sands and peatlands, including wide-open savannas that are extremely rare in Peru; recorded 15 primate species, including the globally threatened red uakari; documented world-record level diversity in plant and vertebrate communities on a poor-soil landscape drained by some of the poorest blackwater streams ever recorded in the Amazon; and notched more than 15 major range extensions for Amazonian birds that specialize on poor soils.

About 3,000 people—both *campesinos* and Capanahua, Kichwa, and Wampis people—live in 22 settlements along the Tapiche and the Blanco rivers. Their livelihoods range from subsistence activities (hunting, gathering, fishing, and small-scale agriculture) to commerce in regional markets (timber, ornamental fish trade). Although many of these settlements date from the rubber boom in the early 20th century, only four are officially recognized as titled lands.

Consolidating the Tapiche-Blanco as a conservation area will involve securing land tenure for local people, promoting better management of natural resources, and putting a stop to illegal logging. Buffered by a ring of communities, a 308,463-ha conservation landscape will form the core of the area, with strict protection for white-sand forests and areas of sustainable use by local residents in the upland and floodplain forests.

# Conservation in the Tapiche-Blanco region

## CONSERVATION TARGETS

- 01 **Peru's largest expanse of white-sand forest (*varillales* and *chamizales*)**, an iconic Loreto vegetation type with high rates of endemism
  - ~18,000 ha of a type of vegetation so rare that it occupies less than 1% of Loreto (Álvarez Alonso et al. 2013). By comparison, the famous *varillales* and *chamizales* of Allpahuayo-Mishana National Reserve cover <12,000 ha (Fig. 5A)
  - Plant and animal species that specialize on or are endemic to these low-statured forests, like the trees *Mauritia carana* (Figs. 6M–N), *Platycarpum* sp. nov. (Fig. 6B), *Euterpe catinga* (Fig. 6G), and *Pachira brevipes*, and more than 10 bird species like *Nyctibius leucopterus* (Fig. 9A), *Myrmotherula cherriei* (Fig. 9F), and *Xenopipo atronitens* (Fig. 9B)
  - Potentially Loreto's largest population of the white-sand specialist and threatened palm species *Mauritia carana* (Figs. 6M–N)
- 02 **A type of vegetation that is even rarer than white-sand forests, and known from just two other sites in Loreto:** savanna-like wetlands with scattered trees, alternating between extremely wet and extremely dry conditions, and possessing a specialized flora. We visited a small patch of this savanna near our first campsite, but the largest expanses are along the middle Tapiche, near the community of Wicungo (Fig. 5A).
- 03 **An extraordinarily diverse lowland Amazonian landscape harboring a wide range of aquatic habitats, terrestrial habitats, and soils that are fragile** and vulnerable to damage from deforestation, road-building, and oil and gas development
  - An impressive complex of rivers, streams, lakes, and flooded areas, ranking among the most important in all of Peru, which form a connection between the Ucayali and Yavarí watersheds during seasonal floods
  - Exceptionally pure water with exceptionally low levels of salts and nutrients, with clearwater streams in upland forests and especially acidic blackwater streams in low-lying areas
  - Large peat deposits that are rich in carbon and vulnerable to anthropogenic fire

	<ul style="list-style-type: none"> <li>▪ An archipelago of white-sand forests (see above), where plants grow so slowly that recovery from disturbance may take decades</li> <li>▪ Large expanses of low-nutrient soils protected by a superficial root mat that limits erosion and retains the nutrients and salts needed by plants and animals (Fig. 4A)</li> </ul> <p><b>04 Large-scale ecosystem services, including:</b></p> <ul style="list-style-type: none"> <li>▪ <b>Some of the highest carbon stocks in Peru</b>, according to Asner et al.'s (2014) map. Carbon in the Tapiche-Blanco region is stored in three reservoirs: 1) as woody biomass in living vegetation, especially in upland forests, 2) as buried organic matter that forms the large peat deposits in the region (Draper et al. 2014), and 3) in the thick mat of surface roots that covers most soils in the area.</li> <li>▪ <b>Intact and continuous closed-canopy vegetation</b> in the Tapiche and Blanco watersheds, which protects ecosystems downstream from extreme floods, sedimentation, and other impacts of deforestation</li> </ul> <p><b>05 Megadiverse plant and vertebrate communities that remain in good condition</b> despite a long history of informal logging, fishing, and hunting</p> <ul style="list-style-type: none"> <li>▪ A well-preserved sample of a region that holds world records in diversity of trees (ter Steege et al. 2003), amphibians, birds, and mammals (Jenkins et al. 2013), fishes, and other freshwater aquatic organisms (Collen et al. 2014)</li> <li>▪ Megadiverse fish communities in a region with blackwater, clearwater, and whitewater habitats that span a large number of watersheds (Yaquerana, Gálvez, Blanco, Tapiche, and Ucayali)</li> <li>▪ Well-preserved amphibian and reptile communities in upland forests and white-sand forests</li> <li>▪ A very diverse primate community with up to 17 species—more than half of all primates known from Loreto</li> </ul>
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**06 Diverse aquatic and terrestrial ecosystems rich in plant and animal life that form the base of the local economy**

- Forests and farm plots containing a vast number of plants used by local residents for food, medicine, and building material (see Appendix 10)
- Blackwater creeks harboring dozens of fish species valued for their ornamental properties, in the genera *Paracheirodon*, *Carnegiella*, *Hyphessobrycon*, *Thayeria*, *Corydoras*, *Monocirrhus*, and *Apistogramma* (Figs. 7A–Q)
- Oxbow lakes with fish species valued as food and as ornamentals, such as arapaima (*Arapaima* sp.; Fig. 7A) and silver arowana (*Osteoglossum bicirrhosum*)
- White water rivers harboring commercial fish stocks that are prized throughout Loreto and that represent an important source of protein for local communities, such as *Arapaima*, *Brycon*, *Leporinus*, *Schizodon*, *Prochilodus*, and *Colossoma*
- Rookeries (nesting colonies of herons, egrets, and other birds) associated with oxbow lakes and flooded forests, the macaw salt lick on the Blanco River, and mammal salt licks throughout the region, which are important tourist attractions
- Forests that maintain healthy populations of game animals, including large birds (cracids and trumpeters) and primates that have been overhunted in much of their geographic ranges

**07 At least 27 species of plants and animals considered to be globally threatened**

- Seven plants classified as globally threatened by the IUCN (2014): *Caryocar amygdaliforme* (EN), *Couratari guianensis* (VU), *Guarea cristata* (VU), *Guarea trunciflora* (VU), *Naucleopsis oblongifolia* (VU), *Pouteria vernicosa* (VU), and *Thyrsodium herrerense* (VU)
- Four plants classified as globally threatened by León et al. (2006): *Cybianthus nestorii* (CR), *Tetrameranthus pachycarpus* (EN), *Ternstroemia klugiana* (VU), and *Ternstroemia penduliflora* (VU)
- Two turtles classified as globally Vulnerable by the IUCN (2014): *Podocnemis unifilis* and *Chelonoidis denticulata*

- Three birds classified as globally Vulnerable by the IUCN (2014): *Myrmoborus melanurus*, *Primolius couloni*, and *Touit huetii*. Sixty-one bird species in the region are included on CITES appendices (see Appendix 7)
- Eleven mammals considered globally threatened by the IUCN (2014): *Ateles chamek* (EN), *Pteronura brasiliensis* (EN), *Cacajao calvus* (VU), *Callimico goeldii* (VU), *Dinomys branickii* (VU), *Lagothrix poeppigii* (VU), *Leopardus tigrinus* (VU), *Myrmecophaga tridactyla* (VU), *Priodontes maximus* (VU), *Tapirus terrestris* (VU), and *Trichechus inunguis* (VU)

**08 At least 20 species of plants and animals considered threatened in Peru**

- Five plants (MINAG 2006): *Euterpe catinga* (VU; Fig. 6G), *Haploclathra paniculata* (VU), *Mauritia carana* (VU; Figs. 6M–N), *Pachira brevipes* (VU), and *Parahancornia peruviana* (VU)
- One reptile (MINAGRI 2014): the turtle *Podocnemis unifilis* (VU)
- The caimans *Melanosuchus niger* (Fig. 8E) and *Paleosuchus trigonatus*, which are Near Threatened according to Peruvian law, and *Caiman crocodilus* which is widely overhunted
- Two birds (MINAGRI 2014): *Nyctibius leucopterus* (VU; Fig. 9A) and *Primolius couloni* (VU)
- Twelve mammals (MINAGRI 2014): *Ateles chamek* (EN), *Pteronura brasiliensis* (EN), *Allouatta seniculus* (VU), *Atelocynus microtis* (VU), *Cacajao calvus* (VU), *Callimico goeldii* (VU), *Dinomys branickii* (VU), *Lagothrix poeppigii* (VU), *Myrmecophaga tridactyla* (VU), *Priodontes maximus* (VU), *Promops nasutus* (VU), and *Trichechus inunguis* (VU)

**09 At least 29 species of plants and animals that have disjunct distributions or are restricted to the Tapiche-Blanco region**

- Four plants considered endemic to Loreto Region (León et al. 2006): *Cybianthus nestorii*, *Ternstroemia klugiana*, *Ternstroemia penduliflora*, and *Tetrameranthus pachycarpus*
- The frogs *Ranitomeya cyanovittata* (Fig. 8P) and *Ameerega ignipedis*, endemic to this area of the Amazon

- Seventeen bird species restricted to poor-soil forests (including *varillales* and *chamizales*), especially White-winged Potoo (*Nyctibius leucopterus*; Fig. 9A), Cherrie's Antwren (*Myrmotherula cherriei*; Fig. 9F), and Black Manakin (*Xenopipo atronitens*; Fig. 9B), with small and disjunct populations in Loreto
- Five bird species restricted to flooded forests in western Amazonia
- *Saguinus fuscicollis*, a primate with a restricted distribution (Fig. 10A)

**10 At least nine plant and animal species that are potentially new to science**

- Plants: a new tree species in the genus *Platycarpum* (Fig. 6B)
- Fishes: four new species in the genera *Tyttocharax*, *Characidium*, *Hemigrammus*, and *Bunocephalus* (Figs. 7R–U)
- Amphibians: four new species in the genera *Chiasmocleis*, *Hypsiboas*, *Osteocephalus*, and *Pristimantis* (Figs. 8F–G, N–O)
- Mammals: an unusual morphotype of the primate *Callicebus cupreus* (*C. aff. cupreus* 'rojo'; Fig. 10N) which may be an undescribed species

## ASSETS AND OPPORTUNITIES

- 01 An opportunity to protect **the largest expanse of white-sand forests (*varillales* and *chamizales*) in Peru**
- 02 A continuous expanse of well-preserved closed-canopy forest that serves as a **conservation corridor connecting nearby protected areas** (Matsés National Reserve, Sierra del Divisor Reserved Zone, and Pacaya-Samiria National Reserve), and linking the white-sand forests and peatlands of Tapiche-Blanco with those elsewhere in Loreto
- 03 **An opportunity to institute formal land rights and natural resource rights in the region**, replacing the old model of informal use with a new system of well-defined rights, based on local residents' broad knowledge of the landscape and its natural resources
- 04 **A consensus among the national and regional governments** that the Tapiche-Blanco region has high conservation value
  - Designated as a conservation priority in Peru's Protected Areas Master Plan (SERNANP 2009)
  - Designated as a conservation priority in the master plan of the Program for the Conservation, Management, and Sustainable Use of Loreto's Biological Diversity (PROCREL 2009)
- 05 An opportunity to **safeguard the region's prodigious carbon stocks**, both above ground (Asner et al. 2014) and below (Draper et al. 2014)
- 06 **Life plans in preparation** for all of the communities on the Blanco River and for 75% of communities on the Tapiche River, thanks to CEDIA
  - Communal statutes and community assemblies strengthened
  - Enthusiasm and interest among local residents in consolidating their communal lands and clarifying their rights
  - A number of agreed-upon priorities at the community level regarding natural resource management

**07 Other incipient community initiatives to oversee and manage the use of natural resources** in the region

- Maps of natural resource use (see Fig. 24) and zoning initiatives in some communities (e.g., Lobo Santa Rocino)
- Informal management plans to manage resources in oxbow lakes (e.g., the *Comité de Vigilancia* to control access to Cocha Wicungo)
- Agreements between communities regarding their shared use of oxbow lakes and rivers (e.g., between Frontera and España)
- Initiatives to manage hunting (e.g., Lobo Santa Rocino)
- Community-led initiatives to organize community members in the face of logging (e.g., the Timber Committee in Nuevo Capanahua) or to respect other communities' access to timber resources
- Cooperation between the community of Lobo Santa Rocino and park guards of the Sierra del Divisor Reserved Zone to help yellow-spotted river turtle (*Podocnemis unifilis*) populations recover
- Increased discussion of natural resource use in community assemblies, and some community-level mechanisms to oversee and enforce regulations (*teniente, policía, varayos*)

**08 Other social assets in communities** with important links to the conservation and sustainable use of natural resources:

- Emerging leaders in communities on both rivers, including women and younger politicians, who can help energize support for conservation in the region
- Support networks, cooperation in emergencies, and communal work parties (*mingas* and *mañaneos*)
- Respect for certain areas on the landscape based on legends and beliefs, which help protect and moderate the use of natural resources
- Communal celebrations and partnerships that strengthen cultural exchange, mutual support, and inter-community harmony



Assets and Opportunities (continued)

- |  |   |
|--|---|
|  | <p>09 The presence in the region of <b>stakeholders who have experience conserving, managing, and using natural resources on Amazonian landscapes</b> (SERNANP, CEDIA, and the Tapiche Reserve)</p> <p>10 <b>The ongoing crisis in the Peruvian timber industry</b>, which has sparked the interest of the Peruvian government and other actors in developing logging methods that are more sustainable, profitable, and fair than the failed concession system</p> |
|--|---|

## THREATS

### 01 Unstable and insecure land tenure

- A very low percentage of communities that possess title to their land, despite a long history of occupation and use
- Two indigenous communities on the Tapiche River that are on the brink of disappearing (Nueva Esperanza and Yarina Frontera Topal); their disappearance would worsen the unstable land tenure situation, since these are titled communities
- A phantom community (Nuevo Trujillo) created under false pretenses by illegal loggers in Requena to gain logging rights via a *bosque local* permit

### 02 Illegal or informal logging operations that have serious negative impacts on social and biological communities

- The pervasiveness of illegal and informal logging throughout the region; irregularities in concessions and permits are the rule
- Weak government oversight of logging in the region (see below) and the failure of the concessions system (Finer et al. 2014)
- Misinformation and uncertainty regarding the legal status and location of logging concessions and permits, and regarding the steps needed to obtain logging rights. Local residents' lack of basic information on logging makes it hard for them to defend their rights.
- Logging concessions that include forests with no commercial timber species (e.g., white-sand forests) or forests with timber species at commercially inviable densities; this gives permit holders an incentive to harvest timber outside of their designated areas
- The persistence in the region of the debt peonage system, which has long been associated with deplorable work conditions (human rights abuses, insufficient pay, lack of accident insurance, worker debt, misleading contracts, etc.)
- Sanctions imposed on some communities by OSINFOR or SUNAT, due to mismanagement of logging permits granted by the Programa Forestal
- Environmental impacts of informal logging (e.g., logging roads and overhunting of game birds and mammals around logging camps). These impacts are not

restricted to upland forests (e.g., rafts of timber are often transported along streams and oxbow lakes)

- Environmental impacts of mechanized logging (e.g., destruction of the root mat, erosion of fragile soils, and sedimentation of streams, rivers, and lakes)
- Little to no forestry planning, which precludes sustainable logging and puts the region's long-term timber stocks at risk

**03 Construction of access roads for logging concessions.** We know of two different road-building initiatives of this type: the Orellana-Tapiche logging road and the network of roads planned by Green Gold Forestry in 2014. The latter consisted of one central road (along the Yanayacu-Tapiche watershed) and a number of secondary roads extending into the Tapiche and Blanco watersheds. Logging roads are a serious threat because they would cause:

- The erosion of fragile soils in the area, which would lead to sedimentation and pollution in lakes and rivers
- The destruction of white-sand forests, a rare natural treasure of the region
- Colonization of new roads, which would lead to a boom in fishing, hunting, and natural resource harvests in the heart of the Tapiche-Blanco interfluvium

**04 Oil and gas exploration and production.** The study area overlaps three active oil and gas concessions (Blocks 137, 135, and 95). Work in these concessions poses serious threats to the region, including:

- Drastic socioeconomic changes, such as a boom in immigration and natural resource use
- Environmental threats to water quality and aquatic ecosystems. One example widespread in oil and gas concessions elsewhere in Loreto are spills of drilling water or oil; these spills cause profound changes in the composition of surface waters, serious damage to floodplain ecosystems, and major threats to human well-being.
- Potential water pollution if the abandoned wells are opened to fracking

**05 Little to no oversight of natural resource harvests in the region.** Hunting of bushmeat—whether commercial, subsistence, or around logging camps—is totally

unregulated, and we saw evidence of overhunting in some areas. Fishing for ornamental fish and food fish is common in the region, but it is generally carried out without management plans, community regulations, or government oversight.

**06 Weak governance.** The absence of government authorities and the isolation and lack of institutional support faced by Tapiche-Blanco residents are at the root of many problems in the region. Some authorities are directly involved in corruption and subject to conflicts of interest, due to their ties to logging. Other problems related to weak governance include:

- Corruption at all levels of the regional government's environmental authorities, which facilitates illegal harvests (especially timber)
- Little to no police presence, which provides free access to drug traffickers, illegal loggers, and other criminal groups
- A lack of supra-communal organizations that can resolve shared problems, and limited political representation at the provincial level
- The chaotic state of the information that government agencies maintain on the Tapiche-Blanco region; data are scattered, imprecise, out of date, difficult to obtain, privately held, and often contradictory
- Low-quality educational opportunities; most communities only have elementary schools, with teachers who are outsiders and present only sporadically
- A local population that remains very much vulnerable to abuse by outsiders, due to the lack of work, information, and educational opportunities
- A poor understanding among residents of legal terms and regulations, which has generated a number of penalties and fines (e.g., those levied by OSINFOR and SUNAT)

**07 Temporary and permanent immigration of workers** drawn to the region by logging activity and oil and gas concessions

**08 A poor understanding of how protected areas can contribute to the protection and management of natural resources.** The perception among large segments of the population in these watersheds is that **any kind of protected area will limit access to resources.**

## RECOMMENDATIONS

Our inventory of the forests between the Tapiche and Blanco rivers revealed large expanses of white-sand forests and wetlands on deep peat deposits, both of them very well preserved, as well as vast tracts of upland forest that remain megadiverse despite years of illegal logging. Because logging has historically been restricted to a handful of valuable timber species, the area still harbors diverse plant and animal communities, sequesters vast carbon stocks, and maintains a high value for conservation.

Land use in the area remains largely informal, and a great deal of work is needed to formalize land titles and land use rights. Some 3,000 people—*campesinos* and members of the Capanahua, Kichwa, and Wampis indigenous groups—live along the banks of the Tapiche and Blanco rivers around the proposed conservation area. Although some of these settlements have been occupied for more than three generations, just three of them currently have title to their land. Meanwhile, dozens of different forestry permits (*bosques locales*, *permisos forestales*, forestry concessions, and *permutas*) have been granted across the landscape; many lack the required papers and several were created illegally. As a result, there is no current, widely accepted map of land use and land rights in the region.

Moving the Tapiche-Blanco region towards a future of conservation and long-term sustainable management will require a series of steps: granting land rights, eliminating illegal logging, promoting more sustainable management of natural resources, and sparking more cooperation between stakeholders in the region. These strategies will provide the foundation needed to declare a conservation area between the Tapiche and Blanco rivers (308,463 ha) offering strict protection for the ~18,000 ha of white-sand forests on the western banks of the Blanco River, and to declare a separate conservation area to protect the large wetlands (~90,000 ha) west of the middle Tapiche River, near the community of Wicungo.

### PROTECTION AND MANAGEMENT

#### 01 Obtain land title for and strengthen the legal standing of communities in the region, based on current use by local residents

- Conclude the process of titling more than 20 communal territories
- Resolve boundary conflicts between communities
- Revoke recognition of Nuevo Trujillo, an abandoned community on the Tapiche River

#### 02 Review and reform logging activities inside the proposed conservation area and in the surrounding communities

*Inside the proposed conservation area:*

- Plan and carry out joint actions between government agencies and local residents to **eliminate illegal logging** in the Tapiche-Blanco region
- **Redraw and relocate the Permanent Production Forests (Zone 1A), as well as inactive or expired forestry concessions;** the remoteness of this region, the sandy, fragile soils, and the lack of high-value timber make sustainable low-impact logging operations an unrealistic proposition

- **Re-assess the viability of the active forestry concessions in the region**, especially the one most recently administered by Green Gold Forestry Perú SAC (74,028 ha) in the heart of the proposed conservation area, which harbors a potentially undescribed primate species (*Callicebus* sp. nov.; Fig. 10N).
- **Map and review the current status of forest access rights** and other extractive rights, and eliminate those that were created illegally (e.g., *bosque local* permits for untitled communities)
- Ensure that authorities at all levels (national, regional, local, communal) **have access to the same information on forest use**

*In the surrounding communities:*

- **Refocus logging on community lands**, with the goal of replacing the current model of large-scale, often abusive logging operations with a new system of small-scale forestry at the community level
- For communities interested in carrying out **sustainable logging on communal lands**, carry out timber surveys on community property, draw up timber harvest plans, and train local residents to effectively manage shared income from logging
- **Free communities from penalties and fines** imposed by OSINFOR, which are often impossible to pay. This can be done if communities band together and seek support from the Defensoría del Pueblo.
- **Continue to provide communities with training and educational opportunities** regarding the technical, legal, and practical aspects of forestry operations, in association with OSINFOR and the Loreto Regional Forestry Program
- **Establish procedures under which communities can monitor and report on illegal logging** both on communal lands and in the proposed conservation area
- **Provide communities with information and training regarding their right to employment** that is free, fair, and adequately compensated, in coordination with the Requena offices of the Ministry of Labor and the Defensoría del Pueblo, and with the regional office of Peru's National Commission in the Fight Against Slave Labor ([http://www.mintra.gob.pe/trabajo\\_forzoso/cnlctf.html](http://www.mintra.gob.pe/trabajo_forzoso/cnlctf.html))

- 03 **Establish a new 308,463-ha protected area for conservation and sustainable natural resource use in the Tapiche-Blanco interfluvium** (Figs. 2A–B). We believe that the great variety of ecosystems, the diversity of wildlife, and the geographic location of this region, which is relatively easy to access from Iquitos, will make it a key destination for ecotourism, scientific research, and sustainable development projects in Loreto. The proposed conservation area will protect Peru's largest expanse of white-sand forests, establish a corridor with the Matsés National Reserve, the Sierra del Divisor Reserved Zone, and the Pacaya-Samiria National

## RECOMMENDATIONS

Reserve, and safeguard vast reserves of aboveground and belowground carbon. Our recommendations are:

- **Involve local communities and residents** in the design, categorization, zoning, and management of the proposed conservation area, in a respectful and effective manner
- **Draw up a zoning and management plan** based on current uses by surrounding communities, in order to guarantee the sustainable use of natural resources in the area
- **Establish guard posts and patrols** to keep the region free of illegal actors
- **Coordinate the management of the proposed area with the other protected areas** in the region
- **Seek out long-term financing for the administration of the proposed conservation area**, recognizing that the crucial role it plays in carbon sequestration in the Peruvian Amazon makes it a good fit for REDD or carbon credit projects, and Peru's National Program for Forest Conservation to mitigate climate change

04 **Protect the extraordinary wetlands on the middle Tapiche River (~90,000 ha)**, near Wicungo and Santa Elena, via a protected area category that allows communities to use them under management plans. These wetlands are an important source of fish and other aquatic wildlife for all of Loreto Region, and a critical refuge for waterbirds and black caiman (*Melanosuchus niger*), which is recovering from years of hunting. A biological and social inventory of these wetlands, potentially led by the Instituto de Investigaciones de la Amazonía Peruana (IIAP), will help determine how best to conserve this ecosystem and its ecological services to the benefit of local communities.

05 **Work closely with communities to build a long-term vision for the conservation and sustainable use of natural resources**

- **Prepare a detailed map of natural resource use in every community.** This will make it possible to effectively zone titled and untitled community lands as well as neighboring lands, as part of the strategy to involve communities in the management and oversight of the proposed conservation area.
- **Prepare life plans for every community.** These should be based on communities' reflection on all of the factors that influence community well-being, including cultural, environmental, social, political, and economic aspects.
- **Promote life plans as a tool for managing community lands in partnership with district and regional authorities**, so that communities can obtain available the public funds (i.e., *presupuestos participativos*) they need to implement their highest-priority aspirations

- **Promote sustainable harvests of natural resources** via formal contracts and agreements between the managers of the Matsés National Reserve, Sierra del Divisor Reserved Zone, and the proposed conservation area on the one hand, and neighboring communities on the other. These agreements should be accompanied by management plans, monitoring of impacts, and a system to guard and protect these resources.
  - **Establish procedures by which communities can monitor and report on illegal natural resource harvests** both on their communal lands and in the proposed conservation area
- 06 **Coordinate activities in the Tapiche and Blanco watersheds** in order to create an integrated landscape of conservation and natural resource management
- **Create an organization that can coordinate activities within each watershed (or in both watersheds)**, based on careful planning with communities on the Tapiche and Blanco
  - **Take advantage of existing social events and opportunities** (community and district celebrations, sporting events, church meetings, etc.) as platforms to discuss shared interests and concerns
  - **Promote coordination between key stakeholders in the region**, including the three municipalities (Soplín, Alto Tapiche, and Tapiche), the various social aid programs, GOREL, SERNANP, SERFOR, El Programa Forestal (Requena, Iquitos), OSINFOR, CEDIA, the Tapiche Reserve, the Ministries of Labor, Education, and Health, PRODUCE, and the Defensoría del Pueblo
- 07 **Validate and promote a diverse array of economic activities**, in order to minimize the risks to local residents of focusing on just one. The local economy currently relies on a mix of different activities, both commercial (ornamental fishes, logging, *fariña*) and subsistence (hunting, fishing, and other harvests), and there are good opportunities to share best practices between communities.
- 08 **End or relocate oil and gas exploration and production in the proposed conservation area**
- **Redraw the three oil and gas concessions (95, 135, and 137) to eliminate overlap with the proposed conservation area** and protect the large expanses of fragile white-sand forests with high levels of endemism
  - **Prohibit fracking in the area**, which is geologically active; any spill of salty formation waters will cause severe damage to the region's exceptionally pure waters





**Inventarios Rápidos/Rapid Inventories**

Protegido/Protected			Hectáreas	Acres
01	Bolivia	Tahuamanu	1,427,400	3,527,182
02	Perú	Cordillera Azul	1,353,190	3,343,805
03	Ecuador	Cofán-Bermejo	55,451	137,022
06	Bolivia	Federico Román	74,054	182,991
11	Perú	Tamshiyacu-Tahuayo	322,979	798,098
12	Perú	Ampiyacu-Apayacu	433,099	1,070,211
15	Perú	Megantoni	216,005	533,760
16	Perú	Matsés	420,635	1,039,412
17	Perú	Sierra del Divisor	1,478,311	3,652,986
18	Perú	Nanay-Pintayacu-Chambira	956,248	2,362,940
20	Perú	Güeppi	592,749	1,464,714
21	Ecuador	Terr. Ancestral Cofan	30,700	75,861
21	Ecuador	Cofanes-Chingual	70,000	172,974
22	Perú	Majuna	336,089	830,494
23	Perú	Yaguas	868,927	2,147,165

Total Protegido/Protected	8,635,837	21,339,615
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**Propuesto/Proposed**

05	Bolivia	Madre de Dios	51,112	126,301
06	Bolivia	Federico Román	202,342	499,998
11	Perú	Yavarí	777,021	1,920,061
19	Ecuador	Dureno	9,469	23,398
23	Perú	Yaguas-Cotuhé	597,471	1,476,383
25	Perú	Ere-Campuya-Algodón	900,172	2,224,373
26	Perú	Cordillera Escalera-Loreto	130,925	323,523
27	Perú	Tapiche-Blanco	308,463	762,228

Total Propuesto/Proposed	2,976,975	7,356,265
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**Fortalecido/Reinforced**

04	China	Yunnan	405,549	1,002,133
07	Cuba	Zapata	432,000	1,067,495
08	Cuba	Cubitas	35,810	88,488
09	Cuba	Pico Mogote	14,900	36,819
10	Cuba	Siboney-Juticí	2,075	5,127
13	Cuba	Bayamesa	24,100	59,552
14	Cuba	Humboldt	70,680	174,654
20	Ecuador	Cuyabeno	603,380	1,490,984
24	Perú	Kampankis	398,449	984,589

Total Fortalecido/Reinforced	1,986,943	4,909,841
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<b>TOTAL HECTÁREAS/ACRES</b>	<b>13,599,755</b>	<b>33,605,726</b>
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## *rapid biological and social inventories*

### **Instituciones participantes/ Participating Institutions**

The Field Museum

Centro para el Desarrollo del Indígena Amazónico (CEDIA)

Instituto de Investigaciones de la Amazonía Peruana (IIAP)

Servicio Nacional de Áreas Naturales Protegidas  
por el Estado (SERNANP)

Servicio Nacional Forestal y de Fauna Silvestre (SERFOR)

Herbario Amazonense de la Universidad Nacional de la  
Amazonía Peruana (AMAZ)

Museo de Historia Natural de la Universidad Nacional  
Mayor de San Marcos

Centro de Ornitología y Biodiversidad (CORBIDI)

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