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Peru

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Lima, Peru

The Field Museum

The Field Museum is a collections-based research and educational institution devoted to natural and cultural diversity. Combining the fields of Anthropology, Botany, Geology, Zoology, and Conservation Biology, museum scientists research issues in evolution, environmental biology, and cultural anthropology. One division of the Museum—Environment, Culture, and Conservation (ECCo)—through its two departments, Environmental and Conservation Programs (ECP) and the Center for Cultural Understanding and Change (CCUC), is dedicated to translating science into action that creates and supports lasting conservation of biological and cultural diversity. ECCo works closely with local communities to ensure their involvement in conservation through their existing cultural values and organizational strengths. With losses of natural diversity accelerating worldwide, ECCo's mission is to direct the Museum's resources—scientific expertise, worldwide collections, innovative education programs—to the immediate needs of conservation at local, national, and international levels.

The Field Museum
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INRENA, Zona Reservada Güeppí

As a legacy for future generations, the Instituto Nacional de Recursos Naturales (INRENA) is responsible for managing the nationally protected areas, with the goal of conserving biological diversity and ecological services that contribute to the country's sustainable development.

The 625,971-hectare Zona Reservada Güeppí was created in 1997, and it harbors great biodiversity. After a long process of participative planning with local stakeholders, the area now has a consensus with a concerted proposal for categorization that includes the creation of two communal reserves (Airo Pai and Huimeki), as well as a national park (Parque Nacional Güeppí).

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Ministerio del Ambiente del Ecuador

The Ministerio del Ambiente del Ecuador (MAE) is the national environmental agency responsible for the sustainable development and environmental quality of the country. It is the highest authority for issuance and coordination of national policies, rules, and regulations, including basic guidelines for organizing and implementing environmental management.

MAE develops environmental policies and coordinates strategies, projects, and programs for the protection of ecosystems and for sustainable use of natural resources. MAE sets regulations necessary for environmental quality associated with conservation-based development and the appropriate use of natural resources.

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Fundación para la Supervivencia del Pueblo Cofan

The Fundación para la Supervivencia del Pueblo Cofan is a non-profit organization dedicated to conserving the Cofan indigenous peoples, their culture, and the Amazonian forests that sustain them. Together with its international counterpart, the Cofan Survival Fund, the foundation supports conservation and development programs in seven Cofan communities in eastern Ecuador. Programs focus on biodiversity conservation and research, protecting and titling Cofan ancestral territories, developing economic and ecological alternatives, and educational opportunities for young Cofan.

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Organización Indígena Secoya del Perú

The Organización Indígena Secoya del Perú (OISPE), is a non-profit indigenous organization founded 22 November 2003 and registered in the Oficina Registral de Loreto, in Iquitos. Its headquarters are located in the native community of San Martín, Anexo Bellavista. OISPE's board members include the President, Vice President, and Secretary of Official Documents and Archives. It has jurisdiction over eight communities in the Napo and Putumayo watersheds, Districts of Teniente Manuel Clavero and Torres Causana, Maynas Province, Loreto.

OISPE's mission is to obtain land titling and legal consolidation of Secoya territory, work toward integrated and sustainable development, and secure Secoya legal rights and autonomy. At present, OISPE is negotiating land expansion and titling for their communal territories, as well requesting recognition of the proposals to establish the Airo Pai and Huitoto-Mestizo-Kichua (HUIMEKI) communal reserves, and the "SEKIME National Park" (Parque Nacional Güeppi), within the Zona Reservada Güeppi.

OISPE

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Organización Kichwaruna Wangurina del Alto Napo

The Organización Kichwaruna Wangurina del Alto Napo (ORKIWAN) is a non-profit indigenous institution created in 1984 and registered in 1986 in the Oficina Registral de Loreto, Iquitos. Its headquarters are located in the native community of Angotero. The governing board includes a President, Vice President, Secretary, Treasurer, Secretary for Indigenous Women, and Advisor of the Organization. ORKIWAN's jurisdiction extends throughout the watershed of the Napo River. It includes 26 communities, of which 17 sit in the district of Torres Causana, and 9 in Napo, all in Maynas Province of Loreto.

The mission of ORKIWAN is to oversee and encourage the financial and legal consolidation of Kichwaruna territory in support of integrated, sustainable development, and the free exercise of indigenous culture, language, and identity. It also seeks to strengthen the capacity for self-governance based on federal rights in support of intercultural development. ORKIWAN promotes bilingual education in its territories and the titling of communal lands.

ORKIWAN

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Organización Regional de Pueblos Indígenas del Oriente

The Organización Regional de Pueblos Indígenas del Oriente (ORPIO, previously ORAI) is an institution with legal status, registered in the Oficina Registral de Loreto, in Iquitos. It includes 13 indigenous federations, composed of 16 ethnolinguistic settlements, along the Putumayo, Algodón, Ampiyacu, Amazon, Nanay, Tigre, Corrientes, Marañón, Samiria, Ucayali, Yavarí, and Tapiche rivers, all in the Loreto Region.

ORPIO is a regional indigenous organization represented by an executive council of five members, each with a three-year term. It has autonomy of decision-making in a regional context.

ORPIO's mission is to work in support of indigenous rights, access to lands, and autonomous economic development based on the values and traditional knowledge of each indigenous community.

The organization promotes communication that enables its members to make informed decisions. It encourages the participation of women in community organization, and works with titling of indigenous lands. ORPIO participates broadly as a consultant, and in working groups with federal and other civil officials, for the development and conservation of the environment in the Loreto Region.

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Herbario Amazonense de la Universidad Nacional de la Amazonía Peruana

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 institution focused on the flora of the Peruvian Amazon. The bulk of the collections showcase representative specimens of the Amazonian flora of Peru, considered one of the most diverse floras on the planet; the herbarium also houses collections made in other countries. These collections serve as a valuable resource for understanding the classification, distribution, phenology, and habitat preferences of plants in the Pteridophyta, Gymnospermae, and Angiospermae. Local and international students, docents, and researchers use these collections to teach, study, identify, and research the flora. In this way, the Herbario Amazonense contributes to the conservation of the diverse Amazonian flora.

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Museo Ecuatoriano de Ciencias Naturales

The Museo Ecuatoriano de Ciencias Naturales (MECN) is a public entity established on 18 August 1977 by government decree 1777-C, in Quito, as a technical, scientific, and public institution. The MECN represents the only state institution whose objectives are to inventory, classify, conserve, exhibit, and disseminate understanding of the country's biodiversity. The institution offers assistance, cooperation, and guidance to scientific institutions, educational organizations, and state offices on issues related to conservation research, natural resource conservation, and Ecuador's biodiversity. It also contributes technical support for designing and establishing national protected areas.

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

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 1.5 million 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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This inventory of the biologically and culturally rich region where Ecuador, Peru, and Colombia intersect was suggested years ago by Randy Borman, Cofan leader. Last year, when we were approached by INRENA-Güepí, and eventually the Secoya Federation (OISPE), we realized the stage was set for an incredible collaboration. The inventory would not have been possible without the deep knowledge and strong organizational skills of local indigenous communities, as well as the support of regional military personnel, collaborating local and national institutions, and other local residents. To all, we offer our sincere thanks along with a huge sigh of relief that together we were able to carry out the long and complicated field itinerary and the subsequent in-country presentations and preparations for the written report.

The *Airo Pai* (Secoya) communities of Bellavista, San Martín, Santa Rita, Nuevo Belén (on the Yubineto River), Mashunta (Angusilla River), Zambelín (Yaricaya River), Guajoya (Santa María River), and Puerto Estrella (Lagartococha River) helped us immensely with field logistics and provided valuable information to the biological and social teams. In particular, we are grateful for the help provided by Gustavo Cabrera, Leonel Cabrera, Ricardo Chota, Segundo Coquinche, Wilder Coquinche, Wilson Coquinche, Gamariel Estrella (Jaguarcito), Javier Estrella, Rita Estrella, Luis Garcés, Andrés Levy, Ceferino Levy, Aner Macanilla, Elizabeth Macanilla, John Macanilla, Olivio Macanilla, Mauricio Magallanes, Cecilio Pacaya, Francisco Pacaya, Rodrigo Pacaya, Venancio Payaguaje, Roger Rojas, Anselmo Sandoval, Guido Sandoval, Marcelino Sandoval y familia, Marcos Sandoval, Moisés Sandoval, Véliz Sandoval, Oscar Vásquez, Germán Vílchez, Jorge Vílchez, Nilda Vílchez, and Roldán Yapedatze.

The Cofan community of Zábalo (on the Aguarico River) was the hub of the biological inventory of the first three sites. The biological team camped at Zábalo the first night in the field and then spun east and north to the first three field camps with the invaluable help of our Cofan collaborators. The following individuals from Zábalo, and from the Cofan communities of Dureno and Chandia Na'e, played central roles in the inventory: Alba Criollo, Braulio Criollo, Delfín Criollo, Floresto Criollo, Maura Criollo, Natasha Criollo, Oswaldo Criollo, Orlando Huitca, Arturo Lucitante, Bolívar Lucitante and family, Elio Lucitante, Alex Machoa, Francisco Machoa, Lucía Machoa, Valerio Machoa, Andrés Mendúa, Luis Mendúa and family, Mauricio Mendúa, Linda Ortiz, Daniel Quenamá, Carlos Yiyoguaje, Debica Yiyoguaje, and Jose Yiyoguaje.

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As usual, our advance teams overcame many challenges.

Guillermo Knell and Italo Mesones, leaders of the two advance field teams, were responsible for the establishment of inventory camps 3, 4, and 5, and their respective trail systems. Through great effort, and with time against them, they were able to complete all of their tasks before the inventory began. Their efforts allowed the biological inventory team to be successful in its work, and we are grateful to them. Other Peruvian friends and colleagues at the Centro de Conservación, Investigación y Manejo de Áreas Naturales (CIMA) provided excellent logistical support in the field, in Iquitos, and in Lima during our trip. We thank Jorge Aliaga, Lotti Castro, Alberto Asín, Manuel Álvarez, Tatiana Pequeño, Jorge Luis Martínez, Yessenia Huamán, Lucía Ruiz, Wacho Aguirre, and Techy Marina.

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From our home base in Chicago, we received invaluable help from these individuals: Jonathan Markel prepared excellent maps using digitalized satellite images, both for the advance team and the later biological inventory team. Dan Brinkmeier quickly produced visual materials extremely useful for in-country presentations, and developed graphics for extension efforts in local communities, all of which explained the results of our inventory. Tyana Wachter was critically important for the inventory, from Chicago to Lima, Iquitos, and Quito. She, together with Chicago-based Rob McMillan and Brandy Pawlak, wove their magic to make problems disappear as they arose. Brandy and Tyana also carefully proofread the report. We thank Wilber H. Gantz for a critical upgrade of our GPS-navigation system. Bil Alverson thanks Drs. Joaquin Brievea, John P. Flaherty and George Mejicano, and the kind staff of the Infusion Center of University of Wisconsin-Madison Hospitals, for expert treatment of leishmaniasis. Finally, Jim Costello and staff of Costello Communications continued to help us streamline and perfect the editing and production of printed and on-line reports, and showed remarkable patience in the process.

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

Approach

During rapid biological inventories, scientific teams focus primarily 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 asset inventories, scientists and local communities collaborate to identify patterns of social organization and opportunities for capacity building. The teams use participant observation and semi-structured interviews to evaluate quickly 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 local and international decisionmakers who set priorities and guide conservation action in the host country.

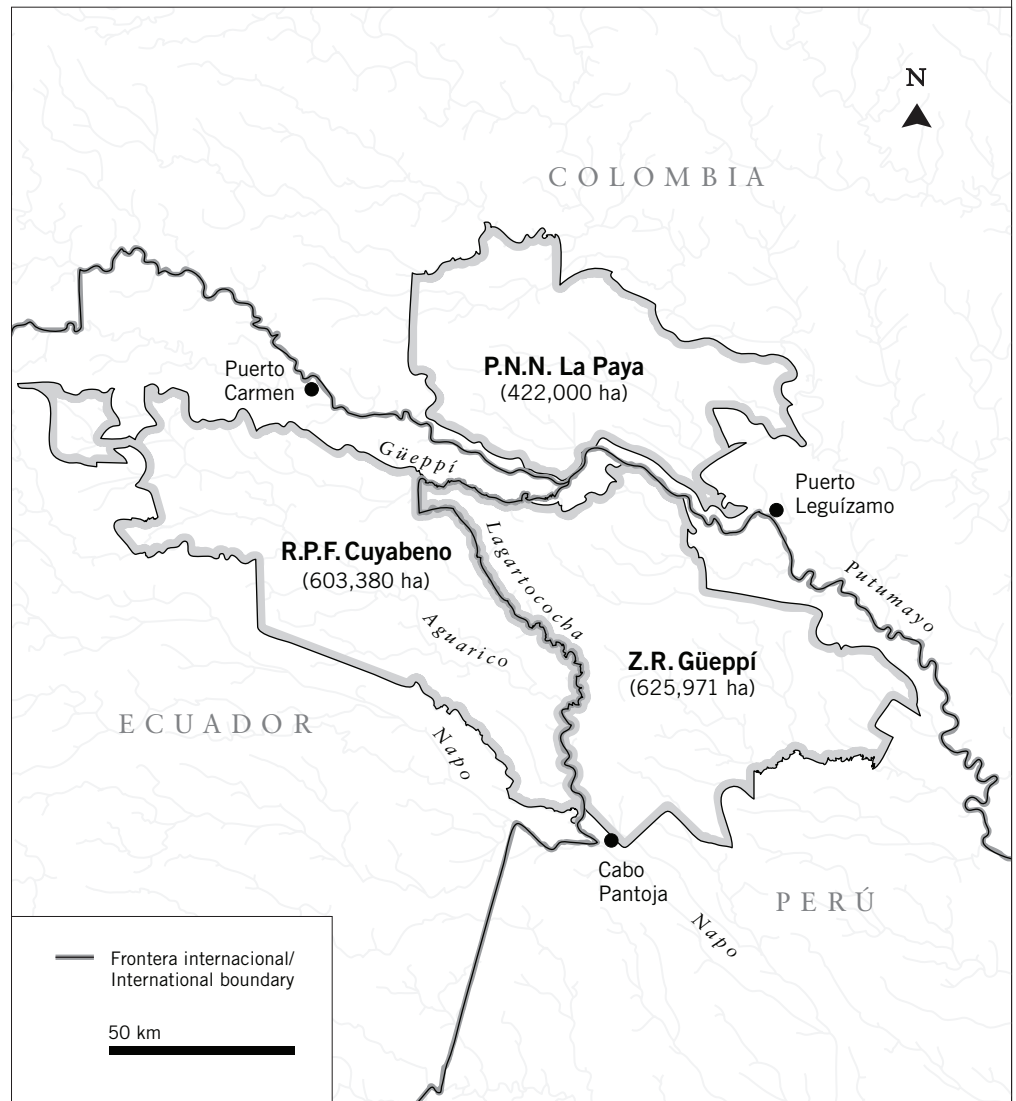
REPORT AT A GLANCE

Dates of field work

Biological team: 4–30 October 2007
Social team: 13–29 October 2007

Region

Three protected areas cover a huge expanse of the interfluvium of the Napo and Putumayo rivers along the borders of Ecuador, Peru, and Colombia: Reserva de Producción Faunística Cuyabeno (Ecuador), Zona Reservada Güeppi (Peru), and Parque Nacional Natural La Paya (Colombia). Together, the areas form a conservation corridor with the potential to be managed as an integrated unit by the three countries.



REPORT AT A GLANCE

Sites inventoried

The biological team visited five sites (two in Ecuador and three in Peru), in the watersheds of the Napo and Putumayo rivers (Figs. 2A, 2C). We did not visit any sites in Colombia.

Napo: Garzacocha, Ecuador, 5–9 October 2007
Redondococha, Peru, 9–14 October 2007

Putumayo: Güeppicillo, Ecuador, 15–21 October 2007
Güeppí, Peru, 21–25 October 2007
Aguas Negras, Peru, 25–29 October 2007

The social team worked exclusively in Peru, visiting 13 communities in the Napo and Putumayo watersheds (Fig. 2A).

Napo: Guajoya, Cabo Pantoja, Torres Causana, Angoteros, 13–21 October 2007

Putumayo: Bella Vista, San Martín, Santa Rita, Nuevo Belén, Mashunta, Zambelín de Yaricaya, Santa Teresita, Miraflores, Tres Fronteras, 21–29 October 2007

In addition to these 13 communities, the social team briefly visited Soplín Vargas, capital of the Teniente Manuel Clavero district (in Peru), and Puerto Leguízamo, a Colombian town that is the largest settlement in this part of the Putumayo River. Álvaro del Campo, logistics coordinator for the inventory, visited Mañoko Daripë, in Peru (also known as Puerto Estrella), a Secoya community on the Lagartococha River, in the Napo watershed, on 11 October.

Biological focus

Soils and hydrology, plants, fishes, reptiles and amphibians, birds, large and medium mammals, and bats

Social focus

Social and cultural strengths, natural resource use, and community management practices

Principal biological results

Zona Reservada Güeppí and Reserva de Producción Faunística Cuyabeno lie in the most diverse forests in the world, and the diversity in all groups we sampled is spectacular. Below we summarize our findings.

	Garzacocha	Redondococha	Güeppicillo	Güeppí	Aguas Negras	Species Recorded	Regional Estimate
Plants	400	700	600	500	400	1,400	3,000–4,000
Fishes	76	87	70	65	37	184	260–300
Amphibians	19	21	46	25	27	59	90
Reptiles	18	23	18	16	17	48	60
Birds	255	284	262	251	247	437	550
Medium and large mammals*	25	31	36	26	24	46	56

* Bats not included here (9 species observed in the first two sites).

Soils and hydrology: Clay soils dominate the region. Hundreds of meters of clay were deposited approximately 8–13 million years ago within a mosaic of lakes and meandering rivers. With the uplift of the Andes, sands and gravels were introduced into the area by fast-flowing rivers, and over time the landscape was sculpted into blackwater lakes, entrenched streams, erosive gullies, terraces, rounded hills, and low-lying valleys that characterize the study area. The clay soils are not easily penetrated by water, causing rain to flow overland from hilltops to clearwater streams or stagnate in lower-lying valleys and swamps. There are very few available minerals in the soils; the majority of nutrients are retained in the forests themselves and in the soil organic matter. Intensive logging or agriculture would quickly drain soil nutrient reserves, leaving behind infertile lands.

Plants: Botanists documented a rich plant community (1,400 species) representing a mix of the floras of eastern Ecuador and northern Peru. We estimate 3,000–4,000 species occur in the region. Our greatest discovery was a tree with large fruits that represents a new genus of Violaceae. In addition, we recorded a handful of new genera for Ecuador (*Chaunochiton*, *Thyrsodium*, *Condylocarpon*, *Neoptychocarpus*) and Peru (*Ammandra*, *Clathrotropis*) and up to 14 species we suspect are new to science. There are timber populations in the floodplains of the major rivers, including cedro (*Cedrela odorata*) and tornillo (*Cedrelinga cateniformis*), and scattered evidence of small-scale logging.

Fishes: The ichthyologists recorded a rich fish community (184 species) representing 38% and 61% of the known diversity for the Napo and Putumayo rivers, respectively. Twenty-three species are new records for Peru or Ecuador, and three appear to be new to science. The Napo-Putumayo interfluvium is a little-studied area that harbors abundant populations of commercially important species such as *paiche*, *arahuana*, and *tucunaré*, all easily observed in the lakes, streams, and rivers. Aquatic habitats range from mixed environments of black waters and clear waters, headwater streams and drainage divides, flooded areas, and a hydrological system influenced by the white waters of the Putumayo and Napo rivers; this great variation in aquatic habitats promotes high fish diversity. Some habitats provide reproductive sites for various species, including species for human consumption. We estimate 260 to 300 species occur in the region.

Amphibians and reptiles: The herpetologists recorded 107 species (59 amphibians, 48 reptiles) and estimate that 150 species (90 amphibians, 60 reptiles) occur in the area. Our inventory revealed 19 new records for the R.P.F. Cuyabeno. The frog *Allobates insperatus*, previously known from Ecuador, was recorded in Peru, and the frog *Pristimantis delius*, previously known from Peru, was recorded in Ecuador. Our record of the frog *Osteocephalus fuscifacies* represents only the second locality in the Peruvian Amazon. In our two Peruvian sites adjacent to Ecuador, we found a species potentially new to science (a frog in the genus *Rhinella*). Commercially important and threatened species are well-represented in our inventory sites, especially black caiman

REPORT AT A GLANCE

Principal biological results (continued)

(*Melanosuchus niger*), white caiman (*Caiman crocodilus*), river turtle (*Podocnemis unifilis*), yellow-footed tortoise (*Chelonoidis denticulata*), and tree boa (*Corallus hortulanus*), all listed by the IUCN and CITES.

Birds: The ornithologists recorded 437 species of birds during the inventory, and estimate that 550 species occur in the region. The bird community includes a rich forest avifauna, and an impressive diversity of aquatic birds along the Lagartococha River, especially herons, kingfishers, and sungrebes. We documented ten notable range extensions to the north; two rare waterbirds, Azure Gallinule (*Porphyrio flavirostris*) and Ash-throated Crake (*Porzana albicollis*); an unexpected migrant (Canada Warbler, *Wilsonia canadensis*); and nine species endemic to northwestern Amazonia. We did not encounter the Cocha Antshrike (*Thamnophilus praecox*), endemic to northeastern Ecuador. North American migrants were present, with small numbers of forest-using landbirds, moderate numbers of swallows and shorebirds, and good numbers of Eastern Kingbirds (*Tyrannus tyrannus*). Game birds are notably abundant and parrot populations are considerable, including large macaws.

Mammals: The mammalogists documented a high diversity of medium and large mammals (46 species), with 11 carnivores, 10 primates, 7 rodents, 7 edentates, 5 ungulates, 3 marsupials, 2 cetaceans, and 1 sirenian. We estimate 56 species occur in the region. Abundances varied, reflecting both productivity levels and human impacts. However, the area supports healthy populations of species threatened in other parts of the Amazon basin, including abundant woolly monkey (*Lagothrix lagothricha*) in the Güeppí drainage in Ecuador, collared peccary (*Pecari tajacu*) and white-lipped peccary (*Tayassu pecari*) in the Putumayo drainage in Peru, and tapir (*Tapirus terrestris*) at all our sites. We were encouraged by the presence of giant river otters (*Pteronura brasiliensis*), a species considered endangered (INRENA, IUCN), critically endangered (Red List of mammals of Ecuador), and near extinction (CITES). We observed several rarely seen species, including pygmy marmoset (*Cebuella pygmaea*) and short-eared dog (*Atelocynus microtis*).

Principal social results

The social team visited 13 Peruvian communities (4 on the Napo River and 9 on the Putumayo River) of Secoya, Kichwa, Huitoto, and *mestizo* peoples. Previous studies (Ibis 2003–2006; APECO-ECO 2006) provide a global context. Communities in both river drainages inhabit a complex social reality produced by the boom-and-bust dynamics of more than a century of extractive economies. However, there are well-established social traditions of management and environmental protection, and social and institutional assets that will enable and promote management and conservation in the Z.R. Güeppí. Most of the population is involved in subsistence-level activities, with low-impact resource use and few links to markets. Nonetheless, both biological and cultural diversity are threatened by new resource-use patterns (e.g., timber, fishing, hydrocarbons) that endanger the abilities of communities to continue to protect their ways of life and resource bases.

Principal threats	<ul style="list-style-type: none"> 01 Low or non-existent appreciation at various social and political levels of the high value of intact cultures and natural resources 02 Vulnerability of border areas 03 Oil exploitation, especially in the Z.R. Güeppí, Peru 04 Depletion of natural resources 05 Insufficient resources to manage the area
Principal assets for conservation	<ul style="list-style-type: none"> 01 Vast extensions of highly diverse, well-conserved, remote forests 02 Diverse and intact hydrological resources (from large rivers to blackwater lakes) 03 Independent establishment by Colombia, Ecuador, and Peru of three adjacent conservation areas: Parque Nacional Natural La Paya, Reserva de Producción Faunística Cuyabeno, and Zona Reservada Güeppí 04 Draft of an agreement by Colombia, Ecuador, and Peru for integrated management of the three adjacent conservation areas as a conservation corridor (<i>corredor de gestión</i>) 05 Existing, effective models of co-administration by local villages and state institutions 06 Strong leadership in indigenous organizations, with support from their constituents 07 Local awareness of the critical importance of the natural environment as the source of basic necessities and foundation for their subsistence economy—complemented by strong communal links and reciprocity—in visited communities
Antecedents and current status	<p>The trinational border of Ecuador, Peru, and Colombia lies at the confluence of the Putumayo and Güeppí rivers. Each country has established a protected area in the region.</p> <p>In Ecuador, the Reserva de Producción Faunística Cuyabeno (603,380 ha) was created in 1979. Five ethnicities (Kichwa, Siona, Secoya, Shuar, and Cofan) live within the protected area.</p> <p>In Peru, the Zona Reservada Güeppí (625,971 ha) was created in 1997. The consensus proposal for categorizing the area—Parque Nacional Güeppí, Reserva Comunal Airo Pai, Reserva Comunal Huimeki—is still awaiting approval by the state of Loreto. Huitoto (<i>Murui</i>), Kichwa, Secoya, and <i>mestizos</i> live in the proposed buffer zone.</p>

REPORT AT A GLANCE

Antecedents and current status (continued)

In Colombia, Parque Nacional Natural La Paya (422,000 ha) was created in 1984. Settlements in the buffer zone, include *campesinos*, Siona, Muinane, Huitoto (*Murui*), and Ingano (Appendix 13).

Since 2006, the three countries have been developing an agreement to manage the areas as an integrated unit, a “conservation corridor” of 1.7 million hectares.

Principal recommendations for protection and management

- 01 Ensure definitive and effective protection of the Reserva de Producción Faunística Cuyabeno and the Zona Reservada Güeppí.
 - Immediate approval of the categorization of Zona Reservada Güeppí (into Parque Nacional Güeppí, and communal reserves Airo Pai and Huimeki)
 - Exclusion of oil concession 117 (Petrobras) from the Z.R. Güeppí in Peru, as well as any other oil concession that overlaps with these conservation areas (Fig. 10C) because of their importance as headwater zones, highly vulnerable to erosion; because of local opposition to large-scale extractive industries; and because it would eliminate the opportunity to finance management and conservation of the area through the carbon market (avoided deforestation)
- 02 Adjust the boundaries of the Reserva de Producción Faunística Cuyabeno and the Zona Reservada Güeppí (Fig. 11A).
- 03 Manage the adjacent conservation areas as a conservation corridor (Fig. 11A), with involvement of the three countries and local indigenous and colonist communities in and around the conservation areas, and incorporate management appropriate to the various conservation categories within each country.
 - Participation of local inhabitants in the development of the management plans (*Plan Maestro/Plan de Manejo*)
 - Development and implementation of a regional plan for organization and zoning in the buffer zone surrounding the conservation corridor
- 04 Rely on local assets and strengths for effective management of the conservation corridor.
 - Strengthened co-administration of the area by local communities, indigenous organizations, and the central government, in order to prevent forest destruction, unmanaged natural resource use, or commercial use of natural resources in the conservation area

ECUADOR



Located in a remote region that may be the most diverse on earth—at the trinational border of Colombia, Ecuador, and Peru—the forests we surveyed held high promise for species new to science or new to each country.

Our findings surpassed our expectations. Although these results still need further analysis, the preliminary numbers are impressive: 1 genus of plant and 13 species (11 plants, 2 fishes) are new to science. And, 4 plant genera and 22 species of plants and fishes had never before been recorded in Ecuador. We summarize the results for our Ecuadorian sites on the facing page.

The biological and cultural wealth of the region merit the highest protection. Coordinated and collaborative management of a “conservation corridor” by the three adjoining countries, as already under discussion by the three governments, will be crucial to secure long-term success for each of the conservation areas and for the entire complex.

Specific to Ecuador, we highlight the opportunity to conserve the entire Güeppí watershed by readjusting the CITY oil concession (Bloque 27; Figs. 10C, 11A).

Also specific to Ecuador is the strength of participatory management and commitment of indigenous communities living within the Reserva de Producción Faunística Cuyabeno, with whom cooperative agreements have been signed since 1995.

Although established in 1979, the R.P.F. Cuyabeno (which encompasses two of our biological inventory sites) still lacks adequate resources for strong management. Increased focus on the biological values of Cuyabeno should yield international interest and support, possibly through the carbon market. Strengthened and formalized coordination among the three countries, along with an intensified and formalized role in management for the Cofan and other indigenous groups, should provide the structure necessary to garner enthusiasm and support from investors in forested, intact landscapes. This region offers opportunities for protection of diversity unique not only in Ecuador, but on earth.

PLANTS

New to science

- **1 genus** of Violaceae
- **11 species** of
Clidemia (Melastomataceae),
Xylopia (Annonaceae),
Catasetum (Orchidaceae),
Plinia (Myrtaceae),
Eugenia (Myrtaceae),
Mouriri (Memecylaceae),
Alibertia? (Rubiaceae),
Paullinia (Sapindaceae),
Vitex (Verbenaceae),
Guarea (Meliaceae), and
Ouratea (Ochnaceae)

New for Ecuador

- **4 genera:**
Chaunochiton (Olacaceae),
Thyrsodium (Anacardiaceae),
Condylocarpon (Apocynaceae),
and *Neoptychocarpus*
(Flacourtiaceae)
- **5 species:**
Vantanea parviflora
(Humiriaceae),
Conceveiba terminalis
(Euphorbiaceae),
Dicranostyles densa
(Convolvulaceae),
Dicranostyles holostyla
(Convolvulaceae), and
Ouratea (Ochnaceae)

Of special interest

- **Crossroads of two extraordinarily diverse floras:** the rich-soil species of Yasuní, Ecuador, and the poorer-soil species of Loreto, Peru

FISHES

New to science

- **2 species** of *Characidium* and *Tyttocharax*

New for Ecuador

- **17 species**, including
Moenkhausia intermedia,
Serrasalmus spilopleura,
Tyttocharax cochui,
Gymnotus javari, and
Ochmacanthus reinhardtii

Of special interest

- **Healthy populations of paiche** (*Arapaima gigas*)

AMPHIBIANS AND REPTILES

New for Ecuador

- **1 species:** *Pristimantis delius*
(a frog known only from the Tigre and Corrientes watersheds in Peru)

Of special interest

- **19 new records for the R.P.F. Cuyabeno**
- **Healthy populations of hunted reptile species**, including black caiman (*Melanosuchus niger*), white caiman (*Caiman crocodilus*), river turtle (*Podocnemis unifilis*), yellow-footed tortoise (*Chelonoidis denticulata*), and arboreal boa (*Corallus hortulanus*)

BIRDS

Of special interest

- **Healthy populations of hunted bird species in the Cofan-managed Güeppicillo site**, including Salvin's Curassow (*Mitu salvini*), Guans (*Penelope* and *Pipile*),

Birds (continued)

and Gray-winged Trumpeter (*Psophia crepitans*)

- **Presence of 7 endemics of northwestern Amazonia:** *Mitu salvini*, *Galbula tombacea*, *Myrmotherula sunensis*, *Herpsilochmus dugandi*, *Gymnopathys lunulatus*, *Grallaria dignissima*, and *Heterocercus aurantiivertex*
- **Abundant numbers of herons**, especially *Agami* and *Cochlearius*
- **Sighting of Harpy Eagle** (*Harpia harpyja*)
- **Sighting of Zigzag Heron** (*Zebrilus undulatus*)

MAMMALS

Of special interest

- **Presence of the critically endangered giant otter** (*Pteronura brasiliensis*)
- Presence of manatees** (*Trichechus inunguis*), listed as critically endangered in Ecuador
- **Healthy populations of woolly monkeys** (*Lagothrix lagothricha*) and **tapirs** (*Tapirus terrestris*) **in the Cofan-managed Güeppicillo site**
- **Presence of pygmy marmoset** (*Cebuella pygmaea*), a common but rarely observed species

PERU



Much of what was known about the forests we surveyed indicated that we would find extraordinary biological and cultural diversity.

Because the region is poorly explored—it sits at remote corners of Peru, Ecuador, and Colombia—we also expected to find species new to science and records new to each country. Our preliminary findings show even more than we expected:

1 genus of plant (which we also found in Ecuador) and 8 species (4 plants, 3 fishes, 1 amphibian) new to science. An additional 2 plant genera and 11 species of plants and fishes are new to Peru. We summarize the results for the Peru sites on the facing page.

Collaborative management of the three adjacent protected areas as a “conservation corridor,” coordinated by the three frontier countries, is under discussion by their governments. This coordination is crucial to secure long-term protection for the exceptional biological and cultural riches in the region, and to secure financing for management of the conservation complex. This conservation corridor, much of which lies in Peru, holds extraordinary promise for the long-term protection of abundant and unique cultural and biological diversity.

Specific to Peru, we highlight the urgent need to approve the recommended final categorization of the Zona Reservada Gueppi (which was created in 1997) into Parque Nacional Güeppí, Reserva Comunal Airo Pai, and Reserva Comunal Huimeki (Figs. 2A, 40). Without final categorization, the entire area remains dangerously vulnerable to degradation and fragmentation.

Also specific to Peru is the overlap of an oil concession (Lote 117) with the entire Zona Reservada Güeppí (Fig. 10C). This headwater region is extremely sensitive to erosion and would be damaged severely by oil exploration and subsequent access to the area by seismic trails. Peru has several strengths on which it can draw, including the great effort of the local Secoya communities, who have organized themselves to provide effective protection (especially with the Reserva Comunal Airo Pai). Similarly, the Huitoto, Kichwa, and local riverine communities (*mestizos*) are beginning to organize themselves to protect the natural resources use in the Reserva Comunal Huimeki.

PLANTS

New to science

- **1 genus** of Violaceae
- **4 species** of
Banara (Flacourtiaceae),
Mollinedia (Monimiaceae),
Vitex (Verbenaceae), and
Columnnea (Gesneriaceae)

New for Peru

- **2 genera:**
Ammandra (Arecaceae) and
Clathrotropis (Fabaceae)
- **5 species** of
Amasonia (Verbenaceae),
Calathea (Marantaceae),
Guarea (Meliaceae),
Dichorisandra (Commelinaceae),
and *Ouratea* (Ochnaceae)

Of special interest

- **Crossroads of two extraordinarily diverse floras:** the rich-soil species of Yasuní, Ecuador, and the poorer-soil species of Loreto, Peru

FISHES

New to science

- **3 species** of
Hypostomus, *Tytocharax*,
and *Characidium*

New for Peru

- **6 species**, including
Leporinus cf. *aripuanaensis*,
Bryconops melanurus,
Hemigrammus cf. *analis*,
Corydoras aff. *melanistius*, and
Rivulus cf. *limoncochae*

Of special interest

- **Apparently healthy populations of paiche** (*Arapaima gigas*), arahuana (*Osteoglossum bicirrhosum*), tucunaré (*Cichla monoculus*), and acarahuzú (*Astronotus ocellatus*)

AMPHIBIANS AND REPTILES

New for Peru

- **1 species** of *Rhinella* (Bufonidae)

New for Peru

- *Allobates insperatus*
(a frog known only from
the Santa Cecilia region
in Ecuador)

Of special interest

- **Second locality for the tree frog** *Osteocephalus fuscifacies*
- **Healthy populations of hunted reptile species**, including black caiman (*Melanosuchus niger*), white caiman (*Caiman crocodilus*), river turtle (*Podocnemis unifilis*), yellow-footed tortoise (*Chelonoidis denticulata*), and tree boa (*Corallus hortulanus*)

BIRDS

Of special interest

- **Healthy populations of hunted bird species**, primarily Salvin's Curassow (*Mitu salvini*), guans (*Penelope* and *Pipile*), and Gray-winged Trumpeter (*Psophia crepitans*)
- **Presence of 5 endemics of northwestern Amazonia:** *Mitu salvini*, *Phaethornis atrimentalis*, *Herpsilochmus dugandi*, *Schistocichla schistacea*, and *Grallaria dignissima*
- **Range extension of Ash-throated Crane** (*Porzana albicollis*)
- **Presence of a rare migrant, Canada Warbler** (*Wilsonia canadensis*)

MAMMALS

Of special interest

- **Presence of the critically endangered giant otter** (*Pteronura brasiliensis*)
- **Healthy populations of white-lipped peccaries** (*Tayassu pecari*), especially in *Mauritia* palm swamps
- **Presence of short-eared dog** (*Atelocynus microtis*), a species rarely observed

Why Cuyabeno-Güepí?

The Reserva de Producción Faunística Cuyabeno and the Zona Reservada Güepí are spectacularly diverse: species richness of several biological groups—plants, fishes, amphibians and reptiles, birds, and mammals—is among the highest of any other region on the planet. The forest and wetland complexes sprawl over a huge area, with limited access by humans. This has confined most commercial exploitation to peripheral areas accessible by rivers and navigable streams, leaving large core areas that function as sources for game populations and safe havens for the myriad other native species, known and unknown, that live there.

Indigenous peoples—Cofan, Secoya, Kichwa, Huitoto, and others—have a deep history in the region. Centuries of turbulence and adaptation to external pressures, such as the rubber boom of the late 1800s and early 1900s, have forced major changes in their social, political, and economic structures. Yet these indigenous communities still depend on the forests, wetlands, and rivers for sustenance and other benefits that offer them a high quality of life. Their interest in retaining their cultures, their local-grown models for the wise use of resources, and their strong support for intact forests and clean waters make them powerful and central allies in conservation.

Two factors warrant immediate action. The government of Peru is now considering the designation of a new national park (Parque Nacional Güepí) and two new communal reserves (Reserva Comunal Airo Pai and R. C. Huimeki). This inventory aims to move that process forward. Meanwhile, a huge petroleum claim (Lote 117 of Petrobras) has been superposed on the entire Zona Reservada Güepí (Fig. 10C). It represents a severe threat to wildlife and human communities. The findings of this rapid inventory emphasize the extraordinary biological and cultural value of the region, will aid local residents in their fight to protect the area, and will support plans already well developed by Peru, Ecuador, and Colombia to manage the region as a 1.7-million hectare “conservation corridor.”

Conservation in Cuyabeno-Güepí

CONSERVATION TARGETS

The following ecosystems, biological communities, forest types, and species are the most critical for conservation in the Reserva de Producción Faunística (R.P.F.) Cuyabeno and the Zona Reservada (Z.R.) Güepí. Some of these conservation targets are important because they are unique in the region; others are rare, threatened, or vulnerable in other parts of Amazonia; some are crucial for human communities or play important roles in ecosystem function; and others are critical for long-term management of the area.

Geology, hydrology, and soils

- Extensive blackwater river and lake systems on clay-based soils, rare in the Amazon Basin
- *Aguajales* (*Mauritia*-palm swamps) that provide critical food resources for regional fauna
- Whitewater-blackwater mixing zones
- Headwaters of the Lagartococha, Peneya, and Güepí rivers, which ensure the integrity of the watershed

Flora and vegetation

- Huge expanses of intact, heterogeneous forests on hills, wet valleys, and river flood plains
- High hills with especially heterogeneous forest, each one different from the next
- Crossroads of two extraordinarily diverse floras (the rich-soil species of Yasuní and the poorer-soil species of Loreto)
- Up to 14 species potentially new to science
- Sparse but viable populations of valuable timber species (e.g., *Cedrela odorata* and *Cedrelinga cateniformis*)

Fishes

- Populations of *paiche* (*Arapaima gigas*), the largest Amazonian fish, threatened in most of its range
- *Arahuana* (*Osteoglossum bicirrhosum*), exploited as an ornamental
- *Tucunaré* (*Cichla monoculus*) and *acarahuazú* (*Astronotus ocellatus*), both commercial species valued as food and ornamentals

Conservation Targets (continued)

<p>Fishes (continued)</p>	<ul style="list-style-type: none"> ▪ Small species of <i>Hyphessobrycon</i>, <i>Carnegiella</i>, <i>Corydoras</i>, <i>Apistogramma</i>, and <i>Mesonauta</i> targeted by the ornamental-fishes trade ▪ Slow-moving, blackwater environments (lagoons, flooded forests) that tucunaré and acarahuazú use for reproduction and as nursery feeding grounds ▪ Headwaters of the Lagartococha, Peneya, and Güeppí rivers that harbor fish species dependent on the Amazon forest for survival
<p>Amphibians and reptiles</p>	<ul style="list-style-type: none"> ▪ Species restricted to the northern portion of the upper Amazon Basin within Ecuador, Peru, and Colombia (<i>Osteocephalus fuscifacies</i>, <i>O. planiceps</i>, <i>O. yasuni</i>, <i>Nyctimantis rugiceps</i>, <i>Ameerega bilinguis</i>, <i>Allobates insperatus</i>, <i>Cochranella ametarsia</i>) ▪ Species traditionally consumed and/or commercial species listed in CITES Appendices and categorized as threatened by the IUCN (<i>Leptodactylus pentadactylus</i>, <i>Hypsiboas boans</i>, <i>Caiman crocodilus</i>, <i>Chelonoidis denticulata</i>, <i>Chelus fimbriatus</i>, <i>Corallus hortulanus</i>, <i>Podocnemis unifilis</i>, <i>Melanosuchus niger</i>) ▪ Species for which insufficient data exist to determine conservation status (<i>Pristimantis delius</i>, <i>Cochranella ametarsia</i>, <i>Osteocephalus fuscifacies</i>)
<p>Birds</p>	<ul style="list-style-type: none"> ▪ Sustainable populations of birds that are hunted (Cracidae, especially Salvin's Curassow [<i>Mitu salvini</i>], trumpeters and tinamous) ▪ Large populations of parrots, including large macaws, and <i>Amazona</i> parrots ▪ Nine species endemic to northwestern Amazonia

	<ul style="list-style-type: none"> ▪ Large populations of herons and other waterbirds along the Lagartococha River, and especially at Garzacocha ▪ Populations of large hawks and eagles, including Harpy Eagle (<i>Harpia harpyja</i>)
<p>Mammals</p>	<ul style="list-style-type: none"> ▪ Abundant populations of mammal species found in the interfluvium of the Napo and Putumayo Rivers that are threatened in other parts of the Amazon ▪ Recovering populations of giant otter (<i>Pteronura brasiliensis</i>), a top predator listed as Endangered (INRENA, IUCN), Threatened with Extinction (CITES), and Critically Endangered (Red List of mammals of Ecuador) ▪ Amazonian manatee (<i>Trichechus inunguis</i>), listed as Critically Endangered (Red List of mammals of Ecuador), pink river dolphin (<i>Inia geoffrensis</i>) and gray dolphin (<i>Sotalia fluviatilis</i>), listed as Endangered (Red List of mammals of Ecuador) ▪ Substantial populations of primates that are important seed dispersers yet susceptible to overhunting, such as the common woolly monkey (<i>Lagothrix lagothericha</i>), listed as Vulnerable (INRENA and Red List of mammals of Ecuador), and the red howler monkey (<i>Alouatta seniculus</i>), listed as Near Threatened (INRENA) ▪ Top predators, such as the jaguar (<i>Panthera onca</i>) and puma (<i>Puma concolor</i>), which are key regulator species ▪ Brazilian tapir (<i>Tapirus terrestris</i>), another important seed disperser, listed as Vulnerable (CITES, INRENA, IUCN) and Near Threatened (Red List of mammals of Ecuador) ▪ Rarely seen species, such as the short-eared dog (<i>Atelocynus microtis</i>) and pygmy marmoset (<i>Cebuella pygmaea</i>)

Conservation Targets (continued)

Human communities

- Paths, streams, and *varaderos* (portages across oxbows and between adjacent rivers) that connect communities and help control of the entrance of outsiders
- Sacred sites indicated on resource-use maps
- Maintenance of native languages as a means of transmitting local wisdom
- Traditional management techniques, such as diversified small farms, *purma* (old field/secondary forest) rotation, off-seasons for hunting and fishing, and the maintenance of norms of behavior through myths and stories

THREATS

01 **Weak or non-existent appreciation of the great value of natural resources and intact cultures**

- Little appreciation, at all levels—from local self-esteem to the highest levels of government—of the enormous value of rich biological and cultural diversity (in large part due to the lack of a concrete monetary value of this diversity)
- Conflicting policies regarding the protection and use of natural resources
- Need for final approval and categorization of the Zona Reservada Güeppí (in Peru)

02 **Vulnerability of frontier zones**

- Lack of coordination and collaboration among the three countries, at multiple levels (local, regional, national, and international)
- Missed opportunities for using the existing infrastructure in frontier zones (i.e., the military posts and soldiers) to support conservation efforts
- Lack of efficient control in border areas, which allows individuals to cross national borders and prey on forests (extracting lumber, overhunting, etc.)

03 **Exploitation of petroleum** (see map, Fig. 10C)

- Lote Petrolero 117 (of Petrobras), which covers the entire Zona Reservada Güeppí, in Peru
- The petroleum concession in Ecuador (Bloque 27, of CITY) that covers a large part of the watershed of the Güeppí River
- Other potential petroleum concessions in the Reserva de Producción Faunística Cuyabeno, in Ecuador
- Pollution from petroleum exploration and production surrounding the conservation corridor

04 **Overexploitation of natural resources**

- Unregulated hunting and fishing, and overexploitation by the military bases
- Unmanaged timber harvest for commercial use
- Inappropriate agriculture in areas dominated by clay soils with poor capacity for recuperation

Threats (continued)

- Deforestation in the headwaters outside of the R.P.F. Cuyabeno and the Z.R. Güeppí

05 Human population pressures

- Human colonization and the advance of the agricultural frontier
- Population growth and *sedentarismo* (increasingly sedentary lifestyles) of local peoples
- Uncertain land tenure of residents

06 Financial pressures

- Lack of resources for management of the R.P.F. Cuyabeno and the Z.R. Güeppí
- Constant pressure on local people to associate with the market economy, putting their natural resources at risk

CONSERVATION ASSETS AND STRENGTHS

01 Great diversity and health of natural resources in the area

- Extensive forests, highly diverse, in a good state of conservation and with limited accessibility (which tends to reduce threats)
- Hydrological resources that are notably diverse and intact (ranging from large rivers to blackwater lakes)

02 Significant social strengths in local communities

- Indigenous organizations with strong leaders and popular support (e.g., FEINCE, FSC, OISPE, ORKIWAN, and FIKAPIR)
- Subsistence economy, complemented by reciprocal trading and strong community bonds, in all of the communities we visited
- Retention of indigenous languages, worldviews, and knowledge in local communities
- Titles to contiguous blocks of indigenous lands, which permits collaborative control of natural resources by the Secoya and Kichwa along the Napo River
- Strong participation by women in public life (e.g., meetings and workshops)
- Local initiatives for the management of natural resources and titling of lands
- Collaboration of external institutions with local communities

03 Some signs that natural resources are valued

- Independent creation by three countries—Colombia, Ecuador, and Peru—of adjacent conservation areas: Parque Nacional Natural La Paya, Reserva de Producción Faunística Cuyabeno, and Zona Reservada Güeppí
- Initial drafting, in 2006, of an agreement by Colombia, Ecuador, and Peru for an integrated-management corridor that includes the three adjacent conservation areas
- Recognition by local communities that the environment is the basis of their subsistence
- Sites rich in biological and cultural diversity, valued as destinations for tourism and scientific studies

04 Biological, sociocultural, and economic connections among the three countries

- Presence of indigenous groups that extend across international borders (e.g., Secoya, Kichwa, Huitoto, Siona)

05 Effective models for co-administration by local communities and national government

- In Ecuador, the successful experience of the Cofan in Cuyabeno
- In Peru, the proposed Secoya, Kichwa, Huitoto, and mestizo reserves (Reservas Comunales), currently part of the Z.R. Güeppi

RECOMMENDATIONS

Below, we provide recommendations for effective, long-term conservation of the area.

Protection and management

- 01 **Secure definitive and effective protection of the conservation areas.**
 - Immediate approval and categorization of Zona Reservada Güeppí, in Peru
 - Exclusion of the Petrobras oil concession (Lote Petrolero 117), and any other oil concessions that overlap the conservation areas because these include headwater regions that are highly vulnerable to erosion, because the concessions are not wanted by local communities and are contrary to the regional vision, because the concessions violate the laws of protected natural areas, and because oil development will destroy the opportunity of entry into the carbon market (for avoided deforestation)
 - Obligatory mitigation of cultural and environmental damage produced by activities associated with petroleum (oil spills, pollution, etc.), and setup of a transparent process for impact assessment, engaging independent professionals in the monitoring and mitigation activities
 - Immediate enforcement of appropriate use of natural resources, in accordance with pertinent laws, to stop overhunting and overfishing in parts of the region
 - Identification of the headwaters that remain outside of the proposed conservation areas, and implementation of strategies to protect these headwaters from pollution and excessive erosion
- 02 **Adjust the boundaries of the proposed conservation areas and build connections with Parque Nacional Natural La Paya, in Colombia (Fig. 11A, Appendix 13).**
 - In Ecuador, excision of the easternmost section of an oil concession (CITY, Fig. 10C), to protect the watershed of the Güeppí River (57,051 ha)
 - In Peru, inclusion of the military zones within the conservation corridor, to promote integrated use and management throughout the area (14,549 ha)
 - In Peru, extension of the conserved area to the southeast to include hill forests, which are rich and very diverse in plant species (141,877 ha)
- 03 **Coordinate management of the conservation corridor among the three adjoining countries: Peru, Ecuador, and Colombia.**
 - Integrated management of the entire conservation area as a conservation corridor, involving all three countries as well as indigenous and riverine (*mestizo*) communities, and incorporation of management appropriate to the various conservation categories within each country
 - Participation of local indigenous and riverine communities in the development of the management plans (*Plan Maestro/Plan de Manejo*)

RECOMMENDATIONS

Protection and management
(continued)

- Development and implementation of land-use planning, zoning, and land titling in the buffer zone of the conservation corridor in all three countries, to stabilize the buffer zone and reduce pressure on the conservation corridor
- Participatory development—involving the three countries and local indigenous and riverine communities—of a shared vision for the conservation of the conservation corridor, with clear assignment of responsibilities to each group to realize this vision
- Development of active campaigns to effectively communicate the biological and social values of the conservation corridor to local and regional audiences

04 Rely on local strengths and assets for the effective protection of the area.

- Strong co-administration of the area by local communities, indigenous organizations and the central government to prevent forest destruction, unmanaged natural resource use, or commercial use of natural resources in the conservation corridor
- Under this co-administration, creation of control mechanisms focused initially on the most critical (most vulnerable) areas
- Establishment of small indigenous settlements at strategic locations in the most critical areas, to ensure a continuous vigil and prevent overharvesting of the forest and encroachment of agricultural lands (e.g., a small Cofan settlement in Cuyabeno on the Güeppicillo River) (Highly fragile sites should be avoided, however.)

05 Enlist frontier military posts in support of protection of the area.

- Creation of agreements to use the military's frontier infrastructure for the protection of the conservation corridor
- Conservation training of armed forces personnel (including specific kinds of monitoring, such as water quality), and development of courses for the various ranks of the armed forces (taking advantage of successful courses already developed for park guards)

06 Ensure the economic resources needed for efficient administration of the conservation corridor.

- Establishment of coordinated, transparent, and efficient administration of the area so that it can enter the carbon market for avoided deforestation (The funds would cover the costs of management for conservation as well as the maintenance of the quality of life in local communities, inside and around the conservation corridor.)

Additional inventories

- 01 Inventory the vegetation of important habitats not visited during the rapid inventory:**
- Sandy *Tachigali* terraces south of the Putumayo River and north of the lower Aguarico River

- The highest, dissected hills north of the junction of the Aguarico and Napo rivers
- The Lagunas de Cuyabeno

02 Inventory the fishes in these areas:

- The mid- and lower Peneya watershed
- The Putumayo River, which crosses a large part of the conservation corridor

03 Carry out additional herpetofauna inventories during different seasons of the year, which would register substantially greater amphibian and reptilian diversity.

04 Conduct additional inventories of birds in the region, especially at other times of year. Surveys of more lake sites along the Lagartococha and the Güeppí would be useful.

Research

01 Study the processes of soil formation on the dominant landforms.

02 Conduct detailed chemical investigations into the nature and distribution of soil fertility.

03 Study the relationships between soil fertility and plant diversity.

04 Investigate the possibility that the Lagartococha lake-river complex was formed by a geological uplift.

05 Study the relevance of hydrologic pulses, for example the effects of mineralization of nutrients during periods of high and low water on fish populations.

06 Study commercially important fish species, including those important for local consumption and regional markets, e.g., paiche, tucunaré, and arahuana.

07 Determine patterns of habitat use, seasonality, and distribution of the large numbers of herons at Garzacocha and in the entire Lagartococha region.

08 Survey Cocha Antshrike (*Thamnophilus praecox*) to determine presence, habitat requirements, population size, and distribution.

09 Study fauna hunted by the military bases, to develop management plans for threatened species, with the indigenous communities.

Monitoring

01 Establish caiman and turtle monitoring programs (emulating Proyecto Charapa within the Cofan community, which has been successful for more than ten years).

02 Monitor populations of hunted bird species, especially curassows, guans, trumpeters.

03 Monitor deforestation in the conservation corridor and its buffer zone.

