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Forest dwellers: Orangutans, whose name in Malaysian means "person of the forest," may be the most charismatic of Borneo's imperiled species. Biologist Willie Smits is now pursuing a controversial plan for saving these apes by growing them a new forest habitat.

Regrowing Borneo, tree by tree

To save orangutans, scientist Willie Smits is restoring a rain forest—and creating new livelihoods for the Indonesian families who help him

By Jane Braxton Little

JUST BELOW THE EQUATOR, ON THE ISLAND of Borneo, a tropical rain forest is rising out of a logged, charred wasteland. Dawn mists cling to the leaves of ginger and mango trees erupting out of a tangle of ferns, rattan and yam vines. A sparse canopy of white-barked acacias shelters them in filtered shade as the sun burns through the haze. From deep in the distance a tuneless chorus of gibbons booms over the clamor of cicadas, while a white-bellied sea eagle soars silently above.

For Willie Smits, this is a miracle in a moonscape. Emerging from what was a biological desert, it contradicts everything most forestry experts have long believed about rain forests. Smits has named it Samboja Lestari, "Everlasting Forest." It gives hope to this ravaged landscape and the thousands of species that depend on it. Most important for Smits, the forest growing before his very eyes is the promise of a future for the world's few surviving orangutans.

"Orangutans are ambassadors of the remaining biodiversity of the Bornean rain forests. If I could re-create habitat for them here, you could do it anywhere," he says.

Smits, 51, is a forester, a microbiologist and the most passionate advocate for that endangered primate. Charismatic and outspoken, for two decades he battled deforestation, fire and conversion of orangutan habitat to oil palm plantations in a desperate attempt to save these animals on the brink of extinction. His efforts won him countless death threats but not the safe haven he sought for orangutans. Today, out of sheer frustration, Smits is re-creating new orangutan habitat one square meter at a time. His partners are the 600 families of the local Dayak tribe in the Indonesian province of East Kalimantan. The welfare of their village is so integrally linked to the success of Samboja Lestari that Smits refers to it as "the people's forest."

The partnership Smits has forged with

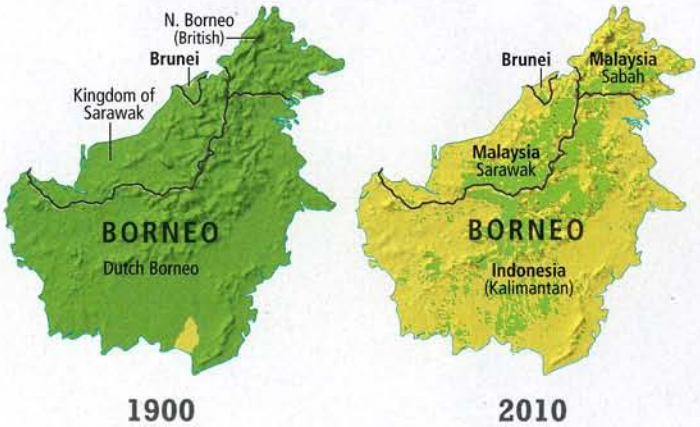
MATT COLLINS (*drawing*); JAY ULLAL (*photograph*)

Destroyed for palm oil: Lowland rain forests in Borneo, where orangutans naturally range, occupy the best terrain for growing palm oil. Consequently, developers still routinely set fires (*above*) and chop down trees (*right*) to clear the land for expanding oil palm plantations, despite laws forbidding the practice. More than 170,000 square kilometers of forest have been lost to plantations, according to World Wildlife Fund estimates.

the local community is key to his success, says Amory Lovins, a renewable energy advocate and chief scientist at Colorado's Rocky Mountain Institute who recently visited Samboja Lestari. "This may be the finest example of ecological and economic restoration in the Tropics."

It is a gutsy experiment that has drawn criticism from both scientists and conservationists. Smits has not presented Samboja Lestari for scientific review, leaving rain forest experts to wonder what he has actually accomplished on the ground. Many of his peers in the conservation community believe his money would be better spent protecting habitat than reconstructing it from scratch. For Smits, a veteran of political controversy who has often been at odds with other orangutan rescue projects, the controversy is familiar. He ignores it.

The Deforestation of Borneo



A native of the Netherlands, Smits traveled to Borneo in 1981 as a tropical forester and microbiologist in quest of a place few others had seen. The world's third-largest island is bigger than Texas and is largely divided into the territories of Indonesia and Malaysia and also the small nation of Brunei. Bisected by the equator, Borneo is a treasure of biodiversity with 15,000 plant species, 222 mammal species, and hundreds of species of birds, amphibians and freshwater fish. When the last ice age ended and glaciers receded, sea levels rose around the island, cutting it off from the Asian continent and leaving its flora and fauna to evolve in isolation. Borneo hosts more than 6,000 species found nowhere else on earth.

It was here in 1858 that Alfred Russel Wallace pondered life across time and space as he wandered alone among dipterocarp trees that towered 60 meters above him. He encountered orangutans and wondered why they were found only in these forests and in neighboring Sumatra. Surrounded by wild nature—drinking the insect-laden liquid of pitcher plants, rhapsodizing over the taste of the durian fruit—Wallace worked through the logic of how every species has come into existence with a preexisting closely allied species. The paper he wrote and sent by slow boat to London spurred Charles Darwin to publish at last his own thoughts on the origin of species. Later Wallace would draw the line east of Borneo that separates the biological realms of Southeast Asia and Australia, a distinction verified a century later as scientists understood the mechanics of plate tectonics.

Borneo's biological bounty began to collapse in the 1970s.

WILLIE SMITS (*top left*); JAY ULLAL (*top right*); MAPPING SPECIALISTS (*bottom*)

Loggers entered the rain forests that stretched unbroken across the island, cutting roads and felling the dipterocarps for their valuable hardwood lumber. The dense stands where Wallace reveled in the cacophony of raucous hornbills and screeching monkeys were filled with the deafening din of chain saws. Habitat that had sheltered so many species for so long was reduced to vast stretches of stumps baking under the equatorial sun. The forests of Borneo have been leveled at a rate so fast "it resembles the end of the world," Smits says. Between 1985 and 2005, the island lost a swath of rain forest the size of Florida.

The Eyes in the Cage

The timber operators did not just empty the land of trees. Once the logs were hauled off for export, they cleared the slopes for agricultural plantations, mostly for growing profitable oil palms used in products ranging from margarine to lipstick. The fastest and cheapest way to be rid of what remained was to burn it, a traditional tribal technique. In 1997 this practice turned disastrous. Aided by two dry years and a late monsoon, even Borneo's productive land began to catch fire. The flames spread, burning for weeks and months, scorching hundreds of thousands of hectares. The choking smoke drifted east across Wallace's line and on to Timor. It billowed west: satellite images showed 30 cities in Indonesia shrouded in smoke and more than 1,000 hotspots of roaring flames racing up rural hillsides. The fires released up to 40 percent of the total carbon dioxide emissions worldwide that year, according to research published in *Nature*.

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—AMORY LOVINS
Chief scientist, Rocky Mountain Institute

Year after year Smits witnessed the destruction of Borneo's rain forests while working as an adviser on conservation issues to the Indonesian government. Much as it distressed him, however, it was a chance encounter with an orangutan that finally transformed the Dutchman-turned-Indonesian citizen. While he was passing through a market in 1989, a caged animal caught his attention. "She had the saddest eyes I've ever seen," Smits says. Those nearly human eyes haunted him. Later that night Smits returned to the market to find the orangutan discarded in a garbage heap. He took her home and nursed her back to health. That rescue changed his life.

Orangutans were already facing a precarious future. Once boasting populations throughout Southeast Asia, today fewer than 77,000 remain in the wild and only in Borneo and Sumatra. Although they had been the object of poachers for decades, the demand for orangutans as pets increased in the 1980s, about the same time logging began destroying their habitat. The losses accelerated with the increasing expansion of oil palm plantations, which forced orangutans out of their remote forest homes. Many were captured and sold. Others were simply killed.

Last year the United Nations Environment Program declared orangutans a conservation emergency. If illegal logging and conversion of rain forest to oil palm plantations are not halted, with-

Ape apocalypse: Poaching has also taken a horrific toll on the orangutans, which in recent decades have frequently been removed from the wild so that they might be kept as pets—often under cruel, harmful conditions (*left*)—or turned into gruesome trophies (*below*).

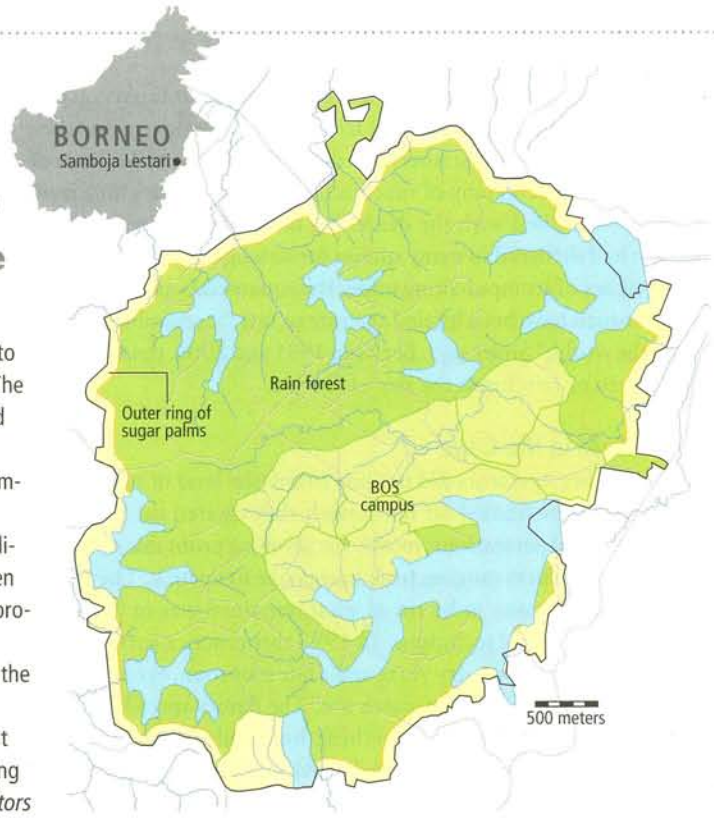
WILLIE SMITS (*left*); JAY ULLAL (*right*)

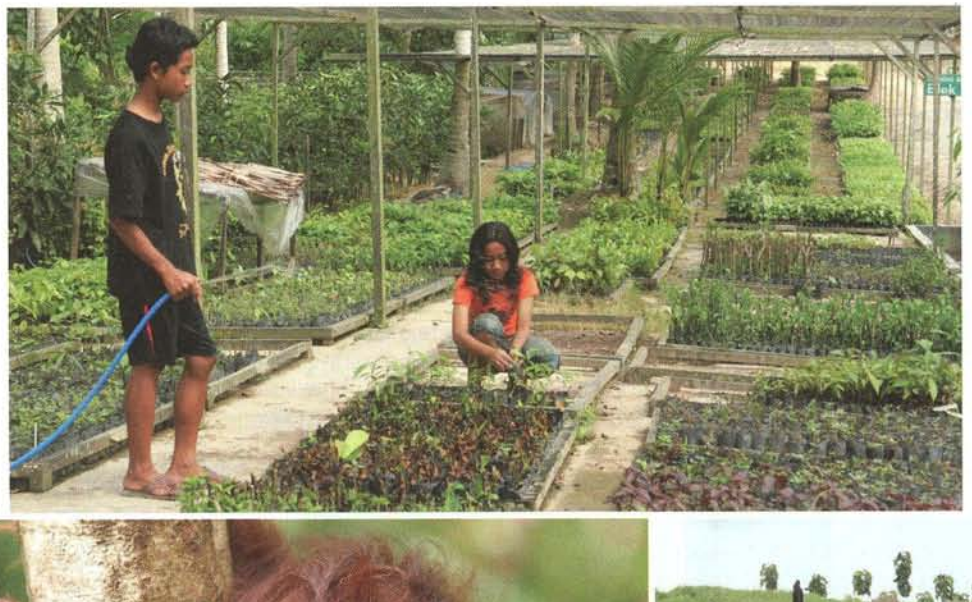
SOLUTION

Samboja Lestari: If all goes as planned, the "Everlasting Forest" will be a place where both wildlife and people can thrive.

The tract of devastated land that Willie Smits hopes to transform back into rain forest is divided into three roughly concentric zones (*map at right*). The thin, outermost area is a cultivated stand of sugar palms growing on land cleared of underbrush. For the villagers who tend these trees, they are a valuable source of food, thatch, medicines and marketable sap. Equally important, however, is that this ring of palms helps to keep wildfires and poachers out of the contained region, where Smits is trying to rebuild a diverse ecosystem of local plants and animals. The innermost zone has been set aside for research and support activities, including visitor education programs and sanctuaries for animals unsuited for release to the wild.

Can Smits's ambitious plan succeed? It may take many years for both the ecological and social aspects of the experiment to prove themselves. Moreover, because Smits has not yet presented evidence for independent review, outsiders can still only guess whether this forest will be everlasting or merely ephemeral. —*The Editors*





At a Glance:

Area: **1,884 hectares**
Tree species: **1,302**
Bird species: **99**
Primate species: **9**
Human residents: **2,000**

In the future forest: Young Indonesians tend saplings in a nursery until the trees are ready to be transplanted into the forested area (*left*). Planted rows of pineapples prepare the ground for those tree seedlings by helping to eliminate unwanted grass (*below right*). This orangutan (*below left*), one of many that Smits has brought into the reserve, calls Samboja Lestari home.

FROM THE THINKERS OF THE JUNGLE: THE ORANGUTAN REPORT. BY G. SCHUSTER.

Whoever thinks that this is too good to be true should come and see with their own eyes that a dream became reality here.

—WILLIE SMITS
Founder, Borneo Orangutan Survival Foundation

Newborn forest: Smits inspects 18 months' worth of growth at Samboja Lestari. The trees in the background help to shade the saplings in the foreground and eventually provide income to local people.

in two decades few orangutans will be left in the wild, the February 2007 report states. Smits's calculations are even more ominous: without drastic changes, he predicts wild orangutans will be extinct by 2012.

Smits formed the Borneo Orangutan Survival Foundation (BOS) in 1991 to prevent that catastrophe. A nonprofit organization dedicated to the conservation of orangutans and their habitat, BOS has taken in nearly 2,000 animals for rehabilitation and reintroduced around 700 back into the wild. The goal was to serve as a way station for orangutans until the deforestation stopped and they could be returned to the remote woods where they had prospered for millennia. "I thought I could save orangutans—put them back in the forest and everybody would be happy. It was a beautiful dream," Smits reflects. But Indonesian forest destruction has been unrelenting, leveling nearly two million hectares a year and taking some 3,000 orangutans with it. Smits finally faced the fact that efforts to protect orangutans in Borneo's existing rain forest were failing. The only way to save them was to re-create a rain forest with the help of the local community, he says: "I just did it."

A Formula for Reforestation

The forest at Samboja Lestari started quite modestly. In 2001 Smits began buying land around the Dayak village, once surrounded by forests but now devastated by oil palm plantations. He paid villagers what he considers a generous price using money raised through a private foundation. Determined to protect the land from government interference, Smits made sure each individual purchase complied with all regulations and that BOS would be guaranteed ownership "forever."

The soils were terrible—infertile, extremely low in nutrients and interspersed with dirt clods hard as steel. Drawing on his background in microbiology and his doctoral dissertation on mycorrhiza, Smits began making enormous quantities of compost. Along with organic wastes, he mixed in sawdust, fruit remnants from the orangutan cages, and manure from cattle and chickens scavenged from his other projects in Kalimantan. His special ingredient was a microbiological agent made from sugar and cow urine. Combined with the humid local climate, each batch of brew was ready in three weeks. Then Smits began planting trees—thousands of them. Each sapling and seed went into the ground with a generous dose of compost. Many of the seedlings came from a nursery he started on the site using seeds he had collected from more than 1,300 species, some from orangutan feces.

The first challenge was killing the alang-alang, a cyanide-secreting grass that had created a desolation Smits calls "a green shroud." He is planting *Acacia mangium* and other fast-growing trees to produce the shade that eventually kills the alang-alang. Once these pioneers have done their job, Smits and the villagers will harvest them and use the lumber in construction.

The entire 2,000-hectare forest is divided into three zones. In the outer zone, a ring 100 meters wide, villagers are planting sugar palms. Families are already enjoying income from the thatch, medicines and edible fruits that sugar palms produce, Smits says. The sap will eventually be processed into sugar at a refinery he plans to build near the village. This 300-hectare outer ring also serves as fire protection. Unlike many local conifers, sugar palms do not burn easily. As an additional defense against fire, each family tending a plot is required to clear the ground around it of alang-alang, undergrowth or anything else flammable.

Inside this fireproof ring is the heart of Samboja Lestari. Smits is planting a wide variety of local trees selected for their benefits to wildlife. Sugarcane, papaya and lemon trees—all will feed the orangutans, birds and other wildlife that are already moving into these woods. Today a half million trees belonging to 1,300 species grow on more than 1,000 hectares. Another 163,000 saplings are in the nursery awaiting transplant. Smits credits the early success of Samboja Lestari to this immense diversity. "What people normally do is plant a million trees and hope for the best. We are re-creating the natural diverse system."

The third and innermost zone, around 300 hectares, has been set aside for a variety of activities that contribute to the emerg-

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Take Action Now

Want to help protect orangutans? Consider making a donation or otherwise becoming involved with Borneo Orangutan Survival International (www.savetheorangutan.org), an umbrella organization for affiliated national groups that raise funds and otherwise support BOS programs in Indonesia. In the U.S., the BOS affiliate is Orangutan Outreach (http://redapes.org); links to all the member groups and additional information about the supported projects are available through the BOS Web site. You might also consider donating to the World Wildlife Fund (www.worldwildlife.org), which has also been instrumental in protecting orangutans.

ing rain forest. Along with an arboretum and forest research facility, it includes sanctuaries for captive animals that cannot be returned to the wild. Smits has also built an education center where visiting schools and other groups can learn about conservation, as well as an eco-lodge to generate income from guests.

He originally designed Samboja Lestari as a sanctuary for orangutans too injured to return to the wild. But as suitable wild habitat in Borneo continues to decline, he may turn it into a last refuge—a "Noah's ark" where orangutans can live freely. For now, while the rain forest is still immature, he is using it as a school for young animals, with a few adults released on their own.

From the start, Smits has incorporated the community into Samboja Lestari. After buying land from them, he hired local men and women to work in the tree nursery and compost facility. He pays them to plant trees, survey and build roads and further encourages them to cultivate fruits and vegetables between the trees. Once the understory creates a canopy too dense for their pineapples and melons, Smits will offer the villagers 3,000-square-meter plots in the outer ring to grow sugar palms. The families who participate can also become shareholders in a fund that pays a small monthly dividend while financing schools and community buildings.

It is an ingenious strategy with benefits beyond income. The gardens within the forest promote the growth of the saplings. The watermelon, beans and other goods they produce generate a food supply, which Smits buys for the orangutans at his center. The sugar palm plots provide a built-in security system; the villagers tending them watch for both poachers and fire. To reinforce this human surveillance system, Samboja Lestari includes state-of-the-art technology using infrared cameras and satellite monitors. Agreements with international space agencies also allow newly trained local electronics specialists to identify the growth of individual trees—as well as their disappearance.

Smits's aim is to engage the villagers in the economic future of the forest project so they will care for it out of enlightened self-interest. Their involvement comes with a tough-love hammer. Should there be what Smits calls "outrage in the sanctum"—should orangutans be stolen or killed—he will cancel the monthly dividend for all tenant families. "This way one can be sure the guilty party will be very quickly found thanks to the great social pressure," he says.

Danger Even in Triumph

The success of this social experiment is not yet confirmed. Neither is the ambitious attempt to reconstruct a tropical rain forest, but Smits is not the first to try. Projects have been in place around the world for decades with varying outcomes. Working with mixed dipterocarp ecosystems is challenging because these forest species are extremely sensitive to disturbance, says Mark Ashton, a Yale University professor of forest studies and silviculture. Most dipterocarps have very poor dispersal systems and do not sprout easily. When they use acacias as pioneer species to create the shade that allows other plants to take root, managers find them hard to remove because they adapt easily and reproduce vigorously. Still, foresters using acacias in Southeast Asian dipterocarp forests have successfully converted plantations, producing closed thickets within 10 to 15 years. Using compost, as Smits is, would speed the process considerably, Ashton says.

Smits has not presented his "miracle forest" for scientific peer review, so how well it is doing is anyone's guess. Widely consid-

JAY ULLAL

Partnership: BOS staff educate the local people who protect and work the land at Samboja Lestari in modern techniques of sustainable agriculture, including advice about crop rotation and planting mixtures of plants together.

ered a loner, Smits is renowned for not publishing his research, including his doctoral dissertation from Wageningen University in the Netherlands. Skeptics of his forest reconstruction project cite his close association with Indonesian officials and timber tycoons and speculate about his motives. Orangutan conservationists say the project is too small to offer anything but temporary habitat. Most would rather see the money go into conserving the existing but fast-vanishing habitat.

Among scientists, rain forest reconstruction itself raises even more fundamental questions. What if Smits and others successfully demonstrate that they can turn devastated lands into multilayered stands supporting a mixture of plant and animal species? In the eyes of developers and policymakers, will that then justify destroying existing rain forests? That's what worries Francis E. Putz, a botany professor at the University of Florida. Even the most successful rain forest reconstruction will not come close to equaling a natural rain forest—not for at least 600 years, he says. Reintroducing multiple species, removing invasives and using compost can accelerate the process of forest succession. But it will take centuries for complex ecological interrelationships to reestablish, and they will not necessarily mirror the original ones.

"If you can restore something, you can destroy it and get it back. That becomes a smoke screen behind which the evil of deforestation continues," Putz says.

Deforestation in Indonesia continues so dramatically that, at the current rate, all but 2 percent of its lowland forests will be gone by 2022, according to the U.N. report. This unprecedented pace has made Indonesia the world's third-largest emitter of greenhouse gases, according to Erik Meijaard, an ecologist with the Nature Conservancy. Recognizing the impact of forest loss on orangutans, in December 2007 the Indonesian government launched an initiative to protect the endangered apes' habitat. Among the programs it establishes are partnerships with timber concessions that allow some logging but prevent the conversion of one million forested hectares to oil palm plantations.

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WILLIE SMITS

Another refugee: The blue-throated bee eater is one of about 100 bird species now residing in Samboja Lestari, much as its ancestors lived in Borneo's original forests.

The plan, endorsed by international conservation groups, can prevent the total release of 700 million tons of carbon. Scientists and Indonesian officials hope the emerging international carbon-credit market among governments and industries will help fund it. If payments for avoiding deforestation become an official mechanism in global climate agreements, carbon buyers can compensate Indonesia for protecting its forests and orangutans. Combined with sustainable economic development for Indonesia, this arrangement has triple-win potential, Meijaard says: "With some political will, it can soon be reality."

After spending decades working with government programs, Smits is skeptical. He calls this plan and its predecessors "NATO: no action, talk only." He is pouring his energy into Samboja Lestari, traveling the world to raise awareness and funds to finance his rain forest reconstruction. Smits is convinced that the local community's commitment to the forest will restore and protect its biodiversity in a way no government plan can. "Make villagers your partners, and nature will come back," he says.

Reasons to Hope

The birds are already back: kingfishers, blue-throated bee eaters and 130 other species have found their way into these woods. Turtles, snakes and anteaters are showing up along with crab-eating macaques. Even the climate is changing. Smits reports increased cloud cover over the forested area has improved the rainfall by 20 percent and lowered the temperature by an average of five degrees Celsius. In the village, crime is down, and employment is up. Lovins, the renewable energy advocate, calls it confirmation of Mahatma Gandhi's philosophy that if you look after the poorest, everything else will look after itself.

Leading a visiting group through young trees now two stories high, Smits radiates infectious enthusiasm. Swallows are swooping around a magnolia tree buzzing with bees. A barking deer has discovered the forage and grazes quietly underneath a flowering gamhar tree. In the distance a long-dead dipterocarp stands sentinel over this new green oasis. And when the lonesome long call of an orangutan punctuates the quiet conversation, Smits just smiles. It's all the motivation he needs to keep on planting seeds. •

Jane Braxton Little is a writer and photographer based in Plumas County, California. She is a contributing editor for Audubon *and* American Forests *magazines.*