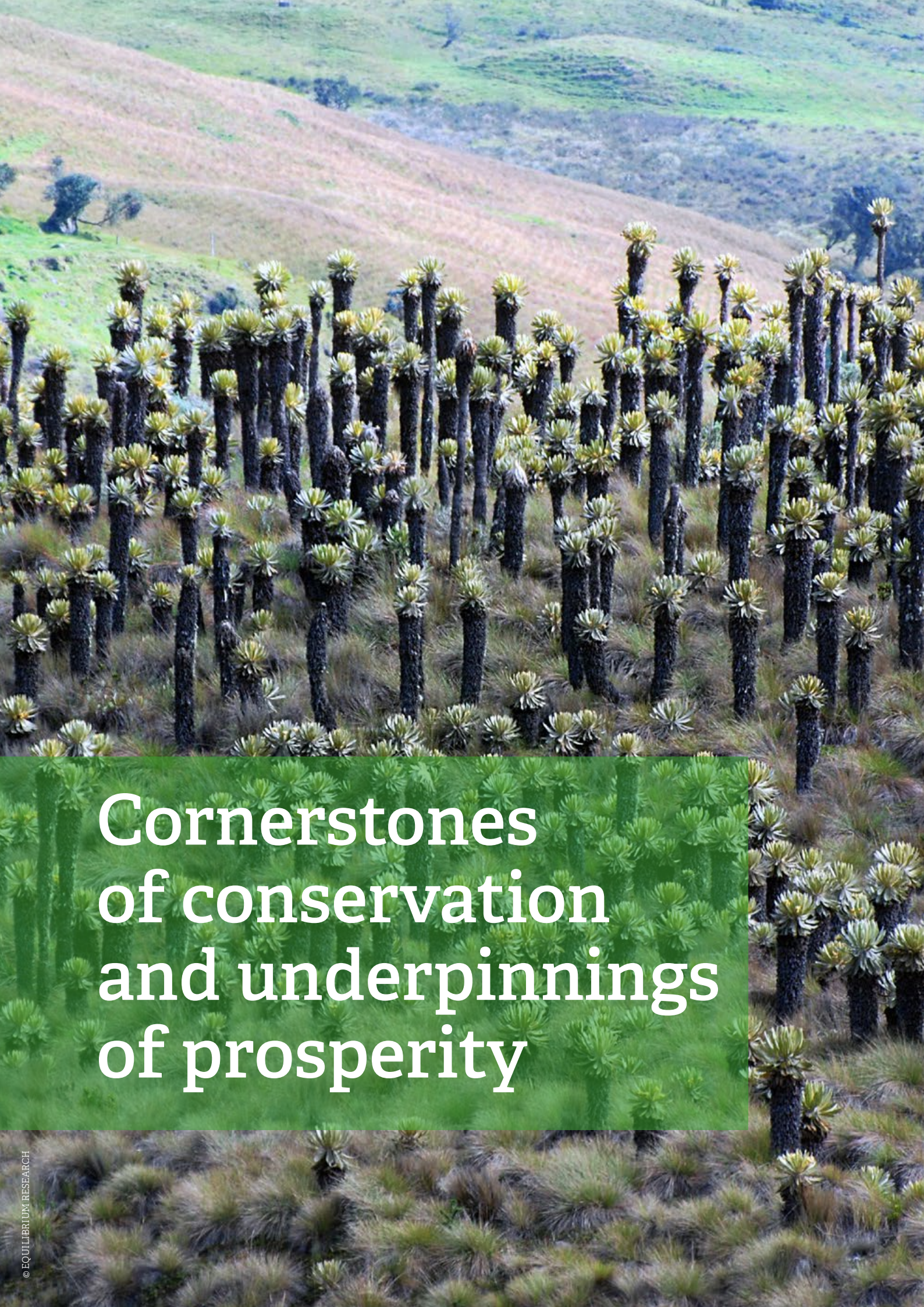
Extract from:

Area-based conservation as a key tool for delivering SDGs



Cornerstones of conservation and underpinnings of prosperity

SDG 15: Life on land

Summary for policy makers

SDG 15 addresses critical challenges caused by the continuing loss of terrestrial species and ecosystems, particularly, but not only, forests, wetlands, mountains and drylands. It also considers the failure of sustainable forest management to reverse natural forest loss, ongoing problems of land degradation and growing threats from alien invasive species. By protecting the natural environment people live in, depend on and draw benefits from, SDG 15 can be considered to underpin long-term sustainability on Earth.

Effective area-based conservation remains the single most powerful tool available to conserve biodiversity, and to maintain the integrity of healthy and resilient ecosystems and deliver SDG 15. Many species today only survive through this mechanism. While protected areas are the best-known approach to area-based conservation and should continue to play a critical role in conservation management, other options are available. Most significantly, recognition of other effective area-based conservation mechanisms (OECMs) – places outside the protected area system that nonetheless provide effective conservation often as a by-product of other management priorities – offers chances to dramatically scale up conservation areas. This is perhaps particularly relevant in terms of growing cooperation with Indigenous people in securing both their land tenure and effective nature conservation. Additionally, conservation corridors are needed to maintain ecological connectivity and other land management approaches are increasingly being used as a contribution to conservation management.

What is the challenge?

The recent report from the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)[1] noted that: "*Human actions threaten more species with global extinction now than ever before. An average of around 25 per cent of species in assessed animal and plant groups are threatened, suggesting that* ***around 1 million species already face extinction****, many within decades, unless action is taken to reduce the intensity of drivers of biodiversity loss. Without such action, there will be a further acceleration in the global rate of species extinction, which is already at least tens to hundreds of times higher than it has averaged over the past 10 million years. ...For terrestrial and freshwater ecosystems,* ***land-use change has had the largest relative negative impact on*** *nature since 1970, followed by the direct exploitation, in particular overexploitation, of animals, plants and other organisms, mainly via harvesting, logging, hunting and fishing*" (our emphasis).

The IPBES report, which received global coverage, held out little optimism for significant improvements any time soon. It is merely the latest in a series of gloomy reviews of the status of biodiversity, from the IUCN Red List of Species,[2] the Ramsar Convention on Wetlands,[3] and in assessments of marine biodiversity,[4, 5] freshwater biodiversity,[6] mammals,[7] birds,[8] reptiles,[9] amphibians,[10] fish,[11] insects[12] and plants.[13] Our state of knowledge on many of the lesser studied groups is still so incomplete that global assessments remain impossible. While success stories, such as the stabilisation of giant panda (*Ailuropoda melanoleuca*) populations in well managed protected areas,[14] demonstrate that effective conservation is possible, even iconic species are declining, sometimes in the face of huge conservation efforts. Lion (*Panthera leo*) populations have fallen steeply in sub-Saharan Africa,[15] and lions now survive in just a quarter of the African savannahs, with only 10 areas in East and Southern Africa relatively secure; elsewhere populations are under serious threat of local extinction.[16,17,18]

Natural forests continue to disappear, and in many areas sustainable forest management still seems a distant goal. In 2014, the New York Declaration on Forests was launched

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to, amongst other aims, halve natural forest loss by 2020. There were almost 200 signatories including global companies, governments, NGOs and Indigenous peoples' organisations. Yet by 2018, the Declaration was already admitting: "*We are not on track … Although partly offset by regrowth, natural forests continued to disappear at an increasing rate. Relative to 2001–13, the average gross annual rate of global tree cover loss* ***was 42 per cent higher in 2014–17***" (our emphasis).[19, 20] In 2018, Forest Trends assessed 469 companies with public commitments to address deforestation. Only 44 per cent had clarified their intention to ensure traceability of products, and less than half of this sub-group had attempted any clear and actionable statements on how they would do this.[21] Deforestation is still destroying forests in tropical countries, with net losses averaging 3.3 million hectares per year between 2010 and 2015; 12 million hectares were destroyed in 2019 alone.[22]

Land degradation, at its most extreme tipping into desertification, is increasing around the world, with an estimated 1.3 billion people, a fifth of the world's population,[23] living on degrading agricultural land.[24] Degradation has multiple facets, including salinisation, affecting some 20 per cent of irrigated cropland;[25] erosion, with estimated rates 100-1,000 times higher than natural and far higher than rates of soil formation; [26] loss of soil organic carbon, primarily through land use change;[27] along with contamination,[28] acidification[29] and compaction.[30] A dramatic decline in soil biodiversity around the world is one of the hidden, but important, aspects of biodiversity loss.[31]

Mountain ecosystems are under particular pressure,[32] with the impacts of over-use in many places being exacerbated by climate change. Other ecosystems, often receiving less attention than forests, are also declining, sometimes as a result of "leakage" of land use change from forest conservation efforts, with grasslands and savannahs being particularly badly impacted.[33, 34] Throughout the world, natural systems outside protected areas are under unprecedented levels of pressure from loss and fragmentation. Even many of those within protected areas also continue to be degraded.

SDG 15 aims to: "*Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss*". This hugely ambitious goal addresses far more than biodiversity, or wildlife conservation. Stabilising terrestrial ecosystems is a critical step in achieving most if not all the other SDGs, underpinning issues of food and water security, political security and climate stabilisation, but also impacting issues like equality, peace and security and the sustainability of the world's urban areas.

SDG 15's targets and indicators address all the issues raised above. They demand conservation of ecosystems, with particular emphasis on forests, wetlands, mountains and drylands, promote sustainable forest management and efforts to combat desertification, and urge the conservation of mountains. SDG 15 also promotes the conservation of habitats and species, and the fair sharing of the benefits that they provide, seeks greater control of alien invasive species and finishes by addressing integrated approaches to conservation planning and sustainable financing for all these actions. Some of the key targets have a 2020 deadline and there is tacit acceptance that they will be revised in line with whatever emerges in terms of 2030 targets from the Convention on Biological Diversity.

How can effective area-based conservation help?

Maintaining species and ecosystems: Protected areas are the main tools for biodiversity conservation in virtually every country in the world. Research shows that well-resourced and effectively managed protected areas prevent the loss and degradation of natural land cover.[35, 36, 37] Protected areas have also slowed the rate of species loss;[38] there is evidence that some species would almost certainly be extinct by now without targeted conservation interventions within protected areas.[39, 40, 41] Protected areas also provide the kind of dedicated management that can help, in many

cases, to address problems of alien invasive species,[42] and to promote restoration of degraded ecosystems.

However, there is also abundant evidence that the current protected area estate is not sufficient on its own to slow the rate of species decline or to prevent the extinction of large numbers of species. Protected area coverage is still nowhere near enough, protected areas are frequently too isolated to provide long-term security to plant and animal populations, they are not always located in the most effective places,[43, 44] and many suffer from serious resource and capacity shortfalls.[45] There is a growing movement arguing for far more ambitious targets for global protected area coverage.[46, 47]

But at the same time, options under conservation are becoming much broader, and thus more complex, with the identification and gradual designation of other effective area-based conservation measures, OECMs.[48] Recognition of such areas, which provide effective conservation outside of protected areas and bring a whole new set of stakeholders into the picture, offer real possibilities to secure major new areas for biodiversity.[49] This matches well with recognition of the conservation effectiveness of many territories of Indigenous people,[50] and the large areas of land and water controlled or claimed by Indigenous people.[51] But it also opens opportunities for working with companies, other local communities, religious groups, the military and other arms of government.

Connectivity areas[52] are increasingly also recognised as key components of the overall conservation matrix,[53] supplemented with more sustainable land management that can supply some aspects of biodiversity conservation, and thus help at a landscape level in conjunction with more dedicated area-based approaches. Such areas may be protected areas, or OECMs, or neither. Targeted interventions will include increasing use of privately protected areas to fill gaps in the network and conserve remnants in otherwise transformed landscapes.[54]

Sustainable forest management is not the primary concern of protected areas, and areas of sustainable forest management are not protected areas. However it is likely that some OECMs will include managed forest areas, judged on a case-by-case basis, and protected areas managed under IUCN category V (protected landscapes) often contain managed forests, particularly in Europe. Some old managed forests contain biodiversity that has adapted to and become reliant on these cultural ecosystems over millennia and these are sometimes included within protected areas. IUCN's OECM guidance recognises as potential OECMs "*Traditional management systems that maintain high levels of associated biodiversity. These could include certain agricultural or forest management systems that maintain native species and their habitat*".[55] There is a continuing debate about the value of managed forests for biodiversity in terms of total number of species supported.[56, 57] But there is little question that such forests can provide valuable buffering of protected areas, habitat for a proportion of endangered species and important connectivity opportunities.

Drylands and desertification:

Effective area-based conservation is also seen as a means of helping to restore land, reduce soil erosion and ultimately prevent degradation.[58] Natural vegetation is a cost-effective stabilising factor to control erosion, dust storms,[59] dune formation and desertification, while the elimination or even reduction of livestock grazing in dryland protected areas can permit vegetation recovery.[60]

Protected and conserved areas thus offer a portfolio of approaches to addressing the critical issues relating to loss and degradation of ecosystems and the whittling away of the world's rich biodiversity. Some of these approaches are already very well known. Others are newer or still under development. They are also supplemented by management actions such as the reduction of degradation in drylands, which are also priorities of this wide-ranging SDG.

Approaches that support SDG 15

Protected areas

- These should continue to form the backbone of any conservation strategy, providing focused attention on biodiversity and management expertise to conserve fragile populations and where necessary restore degraded landscape. These will include protected areas in mainly natural landscapes and seascapes (IUCN categories I-III and VI) and those in fragmented or modified landscapes and seascapes (categories IV and V), where management strategies will be different and may involve maintenance of long-established cultural practices associated with key biodiversity.

OECMs

- These will increasingly be identified and managed by both governments and non-governmental actors, bringing new areas within overall conservation planning, and recognising, and where necessary improving, associated management actions aimed at maintaining biodiversity.

Key complementary approaches

These may be applied in protected areas, or OECMs, or in other effective area-based strategies:

- **Connectivity corridors and steppingstones** can play a critical role in ensuring that remaining natural ecosystems do not become genetically isolated, they may be natural ecosystems or managed ecosystems that nonetheless allow movement of target species.
- **Indigenous peoples' territories and local communities' land and water** are increasingly recognised as vital repositories of nature, and in turn their biodiversity values can provide important arguments for retaining them under their traditional ownership and governance patterns.
- **Climate refugia** that remain relatively buffered from contemporary climate change over time and enable persistence of valued physical, ecological and socio-cultural resources are particularly useful in maintaining species and associated ecosystem services.

Case study

Protecting the Papua New Guinea tree kangaroo, eradicating poverty and building livelihoods of local communities

Yopno-Uruwa-Som Conservation Area, Huon Peninsula, Papua New Guinea

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Co-benefit SDGs

Midori Paxton and **Andrea Egan** (UNDP). **Trevor Holbrook** and **Lisa Dabek** (Tree Kangaroo Conservation Program).

"I can see young people in Huon Peninsula's Yopno-Uruwa-Som (YUS) are beginning to realise their role in the community as future leaders. Likewise, the broader community has shown their appreciation for youth interest in upholding cultural values in connection with the YUS environment."

– Gibson Gala, TKCP Education & Leadership Coordinator –

Background: Tree kangaroos are found only in the rainforests of Australia, Indonesian West Papua and Papua New Guinea (PNG). Looking like a cross between a kangaroo and a lemur, they have adapted to life in the trees, with shorter hind legs and stronger forelimbs for climbing. Despite weighing up to 10 kg, tree kangaroos are remarkably elusive and often invisible high in the forest canopy.

In Papua New Guinea, tree kangaroos are the flagship species for the rare cloud forests – a high elevation rainforest characterised by low-level cloud cover. As a flagship species, the health of the tree kangaroo reflects the health of their wider ecosystem. By focusing on and achieving conservation of the tree kangaroo, the status of many other species that share its habitat – and are vulnerable to the same threats – may also be improved.

Found from the western side of Papua New Guinea to the eastern coast of the Huon Peninsula, many of the 14 known tree kangaroo species call PNG home, living in some of the last undisturbed rainforest habitat in the world.

Papua New Guinea's Huon Peninsula is an extremely rugged mountainous area rising from the famed Coral Triangle to 4,000-metre peaks and is blanketed by one of the world's largest remaining cloud forests.

The Huon Peninsula's Yopno-Uruwa-Som (YUS) landscape is dotted with 50 remote villages, home to about 15,000 people who, under PNG's customary land tenure system, collectively own and control their entire 1,600 km² landscape.

Rural communities in PNG live a primarily subsistence lifestyle, relying on their natural resources and fertile soil as their ancestors did for generations before them. However, community leaders in YUS noticed worrying challenges that previous generations had never experienced: important resources were becoming scarce.

"Our hunters had to travel longer distances to find animals in the forest. Sometimes we

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had to hunt in areas belonging to other clans without their consent because we could not find enough in our traditional land to feed our families."

– Matthew Tombe, Isan village, YUS –

Sustainability challenge: Sought after for subsistence hunting and comprising a part of rural PNG communities' diets for centuries, several species of critically endangered tree kangaroos have been hunted almost to extinction. But local communities and conservation groups are now fighting together to save them.

The landowners of YUS were determined to find a lasting solution and, in 1996, met Dr Lisa Dabek, a conservation biologist who came to YUS to study and conserve the endangered Matschie's tree kangaroo (*Dendrolagus matschiei*) – endemic to the Huon Peninsula. Despite diverse perspectives and interests, they united around a common objective: protecting the Matschie's tree kangaroo and its habitat along with supporting the YUS communities. With this partnership, the Tree Kangaroo Conservation Program (TKCP)[61] was born.

Over the years that followed, stakeholders across YUS – inspired by respected landowner Mambawe Manaono of Kumbul village – traversed their landscape to advocate for conservation and sustainable use of the forests for the wellbeing of future generations.

Together with the Tree Kangaroo Conservation Program, locals had an ambitious goal: collecting land pledges from dozens of clans across YUS and creating the country's first nationally recognised conservation area. In 2009, with more than 78,000 hectares of land pledged, their goal was achieved and the YUS Conservation Area was established.

"With the creation of the YUS Conservation Area and the support for conservation throughout YUS, I am seeing a huge change. I am seeing animals just on the edges of the villages, the gardens and even within village boundaries. More and more YUS villages are pledging areas of their customary land for conservation so that they can contribute and benefit from these changes as well."

– Matthew Tombe, Isan Village, YUS –

Under PNG's unique land tenure system, more than 90 per cent of all land in the country is held and controlled by customary landowners. As such, the sustainability of conservation efforts depends upon the commitment of local tribes and clans. In these remote, difficult to access places, work in PNG to save the tree kangaroos is fundamentally about empowering local environmental stewards.

Conservation solution: The TKCP and the YUS Conservation Area have become a national model for conservation within the unique context of PNG's customary land tenure system. With funding from the Global Environment Facility and UNDP support, the Tree Kangaroo Conservation Program is building the capacity of local communities and other stakeholders to manage the YUS Conservation Area in perpetuity.

The YUS Conservation Area is achieving its objectives; the forests and ecosystem are healthy, and key species like the Matschie's tree kangaroo are thriving in the protected areas. The people of YUS are also benefitting

from project activities, which have brought substantial improvements to local livelihoods like coffee and cocoa, as well as new opportunities for education and health. Now a team of local YUS Conservation Area Rangers monitors the protected area on a monthly basis.

"Our clans have lived here for generations – we are a part of the landscape. I think that what we are doing here shows that we can play an important role in conservation."
– Nomis Simon, Singorokai village, YUS –

Since the creation of the YUS Conservation Area in 2009, the Tree Kangaroo Conservation Program has expanded from its mountainous roots to embrace a "ridge to reef" landscape approach, including initiatives for the conservation of marine and coastal reef ecosystems and associated coastal agricultural areas, as well as settlements belonging to more than 50 villages within the YUS area. It has also shifted from a single-species focus to include a wide range of endemic and threatened species, such as leatherback turtles, dugongs and long-beaked echidnas (*Zaglossus*). Involving coastal communities in conservation action whilst providing sustainable economic opportunities has been a critical step in ensuring the long-term sustainability of the YUS Conservation Area.

Protecting the biodiversity and habitat of YUS requires coordinated commitment and action across the entire landscape, both in and around the Conservation Area. To sustain the needs of local communities, the natural resources and services provided by the environment beyond the protected area must be maintained for the benefit of current and future generations. Managing the responsible use of the forest products, wildlife and water in these areas will ensure the YUS communities' continued commitment to protecting the YUS Conservation Area.

TKCP directly supports the communities in the tree kangaroos' native habitat, who in turn protect their ecosystem. The people of YUS rely on the natural environment for their day-to-day needs. TKCP works with communities to address their need for sustainable livelihoods, access to health, education and skills training. In partnership with the government, businesses and other NGOs, TKCP builds connections to provide YUS communities with alternative opportunities which build local resilience and reduce the threat of short-term financial gain through large-scale resource extraction.

Lessons learned: With the fate of the tree kangaroo bound up with their native ecosystems and the people who rely on them, conservation success depends on finding a balance between human need and nature's requirements. Eradicating poverty and building livelihoods is therefore critical in the fight to save the tree kangaroo and in ensuring sustainable land and resource use.

Tree kangaroos are the flagship species for the rare cloud forests and losing them would create reverberations throughout these ecosystems. This, in turn, would lead to follow-on effects for the local communities who often rely on the tree kangaroo's habitat for food, medicine and fuel. Protecting tree kangaroos means conserving its environment for the benefit of people and nature.

Next steps: In 2020 a new Strategic Plan was developed for the next 5-10 years of the YUS Conservation Area and TKCP. TKCP will focus on a landscape approach and regazetting as a YUS Landscape Conservation area to include the core protected area as well as sustainable land use throughout YUS. Work is also taking place to build up the YUS Conservation Endowment to support management of the Conservation Area for the long term. And TKCP has also just started as a partner in a USAID Biodiversity project as a Learning Landscape to share with other NGOs how to successfully create and sustain community-based protected areas in other areas of PNG.

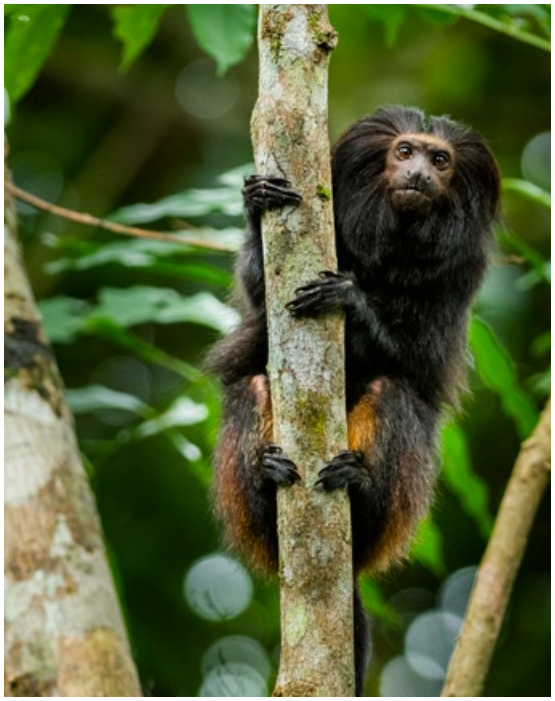
This case study is based on the photo essay: A Home in the Clouds,[62] *plus written material and direct input from project partners at TKCP.*

Information linked to this case study can also be found through the PANORAMA initiative.

Case study

Saving the black lion tamarin, securing long-term sustainability for local communities

Morro do Diabo State Park and Black Lion Tamarin Ecological Station, São Paulo, Brazil



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"The man in red (debt) does not protect the green (environment). IPE understands this dilemma and has paid attention to environmental and social needs."

– Valentim Deagsperi, settler from the agrarian reform –

Background: The Brazilian Atlantic Forest is one of the richest ecosystems on Earth and today highly endangered. The number of species it holds is extraordinary and many are now disappearing. Among them are the four lion tamarins, each endemic to a portion of this biome. The black lion tamarin (*Leontopithecus chrysopygus*) inhabits the western portion of the state of São Paulo, and for more than 60 years was considered extinct. It was rediscovered in the Morro do Diabo State Park, in the early 1970s by Adelmar Coimbra-Filho but was subsequently listed on IUCN's Red List as among the ten most endangered species in the world.

In 1992, the Institute for Ecological Research (IPE), an NGO, was founded to support the work of Claudio and Suzana Padua and a group of young students who had initiated the first studies of the species in the early 1980s. Many of the original group of interns and researchers stayed on and today, besides continuing the efforts to save the black lion tamarin and its forests, IPE counts on more

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Co-benefit SDGs

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IPE INSTITUTE FOR ECOLOGICAL RESEARCH

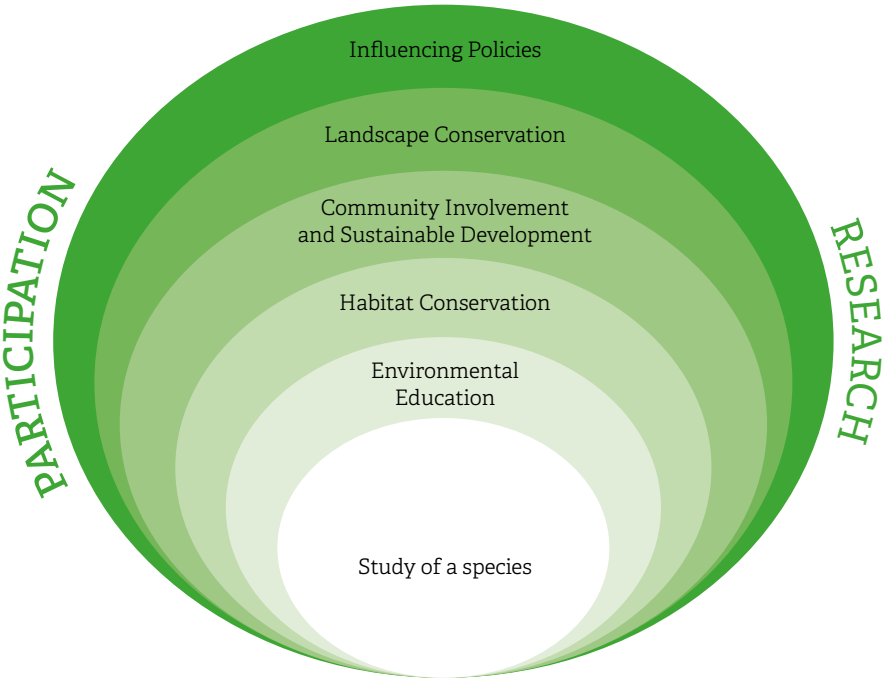

Figure 15.1.
IPE Conservation Model.[65] Based on Valladares-Padua, Cullen Jr., Martins & Lima (2002).

than 100 professionals working on numerous projects in many regions of Brazil, including in the Atlantic Forest, Amazônia, Cerrado and the seasonally flooded ecosystems of the Pantanal of Mato Grosso do Sul.[63]

What started out as a field study to understand the ecology and needs of the species in its original habitat quickly had to be expanded to embrace the complex issues encountered in securing the future of the black lion tamarins. This included addressing issues linked to the socio-economic security and wellbeing of local communities.

Consequently, the conservation of the species soon proved to be more complex and demanded broader approaches, including the search for sustainable development alternatives for the region and other measures (Figure 15.1). Currently the region hosts two conservation areas: the Morro do Diabo State Park (established in the 1940s) and the Black Lion Tamarin Ecological Station (established in 2002). The former consists of a 37,000-hectare area administered by the Forestry Institute of São Paulo, and the latter is composed of four fragments under federal administration.

Sustainability challenge: The forests of western São Paulo were historically devastated in different regions since the 1950s, especially due to unsustainable land-use practices. The native forests that survived in this region, however, are key to guaranteeing the protection of the original biological diversity and related ecosystem services (e.g. soil protection, water quality and carbon sequestration) and to avoid the consequences of climate change; change that is already being felt locally. For example, extreme heat effects and water scarcity have become current concerns in the region with conservation and reforestation alleviating both these risks. To enable the delivery of conservation and wellbeing benefits, the existing forests need protection and enhancement as they suffer from edge effects (i.e. the exposure and susceptibility to adverse weather and agricultural practices on the borders of the forests). Consequently, without conservation and restoration efforts the forests are at risk of losing their ecological integrity and associated benefits to local communities.

Conservation solution: To address the above, tree planting plays a key role in the conservation efforts. Millions of trees are being planted around key forest fragments and in corridors that link these fragments. In addition, small agroforestry plots are created with the planting of native trees together with

shaded coffee and other products that enrich local people's diets and also bring back birds and insects that then spread seeds for free. These measures help maintain the integrity of the ecosystem and mitigate the effects of climate change when deforestation occurs.[64]

Over the years, the Morro do Diabo State Park and the Black Lion Tamarin Ecological Station have become drivers for forest restoration activities and the promotion of sustainable land-use practices within the region. The first step towards addressing the threats to both the black lion tamarin and the long-term sustainability of remaining native forests has been to engage local communities through environmental education. When people were made aware of the importance and rarity of a primate that was largely restricted to just the forest where it was rediscovered and the few remaining fragments, they became more interested and involved in its protection. Furthermore, environmental education has helped share information on the role well-functioning forest ecosystems play in supporting wellbeing and livelihoods for the communities themselves.

The second step involved saving the forest habitat of the species. It was particularly important to reduce the pressure on the Morro do Diabo forest and enrich the remaining fragments. Landscape planning became a priority and IPE conducted the design of a "Dream Map" for the region (figure 15.2), which points to where protection is most needed, or where habitat restoration must be carried out. In this way, the IPE team identified where to re-establish connectivity among the forest fragments in the region and plant buffer zones. Everything is done with the involvement of local stakeholders and community members, mainly comprising poor families settled in an agrarian reform programme that resulted in thousands of small plots, many adjacent to what still remained of the original forests.

To support and promote reforestation and restoration initiatives, IPE offers training through meetings and workshops on why and how planting trees can be beneficial and where to plant different species, explaining the advantages for wildlife and for the people. Guidance is provided to ensure that the seedlings are healthy and of adequate size, preferably grown and cultivated by the families themselves so as to provide them with an income. At the time of planting, a community gathering is organised with all taking part in a celebration, and then planning the necessary monitoring and

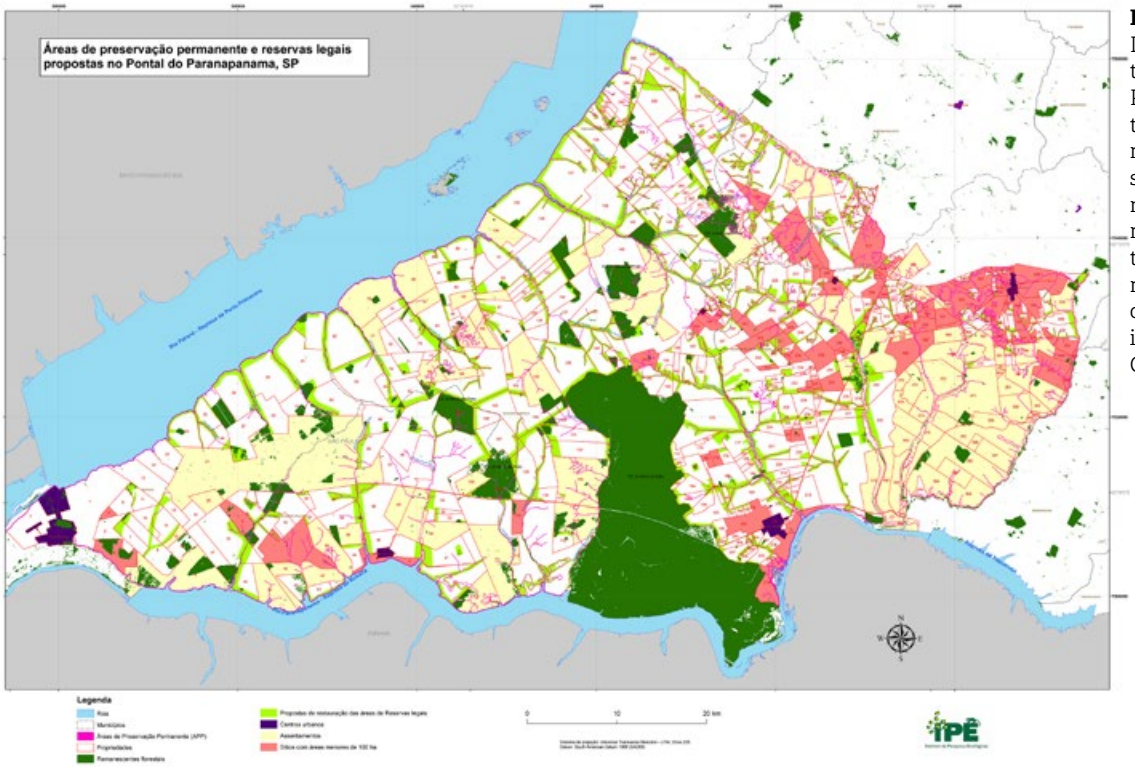

Figure 15.2. The Dream Map of the Pontal do Paranapanema, the westernmost region of São Paulo state, Brazil. The map is a tool for regional planning to prioritise reforestation and other conservation initiatives. Based on Cullen, Jr. (2020).

maintenance of the restored areas – checking for the presence of damaging ant colonies, making sure that cattle and other livestock that would eat and trample the seedlings are kept away, and monitoring the seedlings for any signs of disease or insect pests.

A key objective of forest restoration, besides enriching the environment, was to identify and establish sustainable alternative livelihoods for low-income households, with a focus on nature-based solutions. The aim was to improve people's livelihoods and, at the same time, "green" the region through native tree nurseries for reforestation, and by encouraging and supporting the manufacture of handicrafts that are decorated with images of local species. Planting buffer zones and gallery forests (along riverbanks) on a large scale was particularly encouraged, with the additional incentive that water protection had become a primary concern in the region.

Local communities are central to addressing regional sustainability challenges. It is important that people feel part of the process and, consequently, become involved in the maintenance of the forests they have planted. In order to promote this approach, the "Dream Map" for regional planning was key in identifying priorities regarding forest corridors and other initiatives, such as where corridors were most needed, where forests had to be better protected, or where people could help and also where people represented a stronger threat to the environment, for that is where IPE needed to work the most (Figure 15.2). This visualisation of what could and should be done has been helpful to decision-makers and in influencing policies for conservation-related measures in the region.

The native forests that survived in western São Paulo are key to guarantee the survival and enrichment of the entire Atlantic Forest of the Interior biome. Over the years, IPE has developed strategies and techniques in all the different reforestation stages, mainly based on the research that it has conducted. Examples include how to plant different tree species, at what time of the year, how to involve local people in diverse ways according to circumstances, how to proceed in collecting data in the field on black lion tamarins, jaguars, tapirs and other species. Technologies used also include the use of

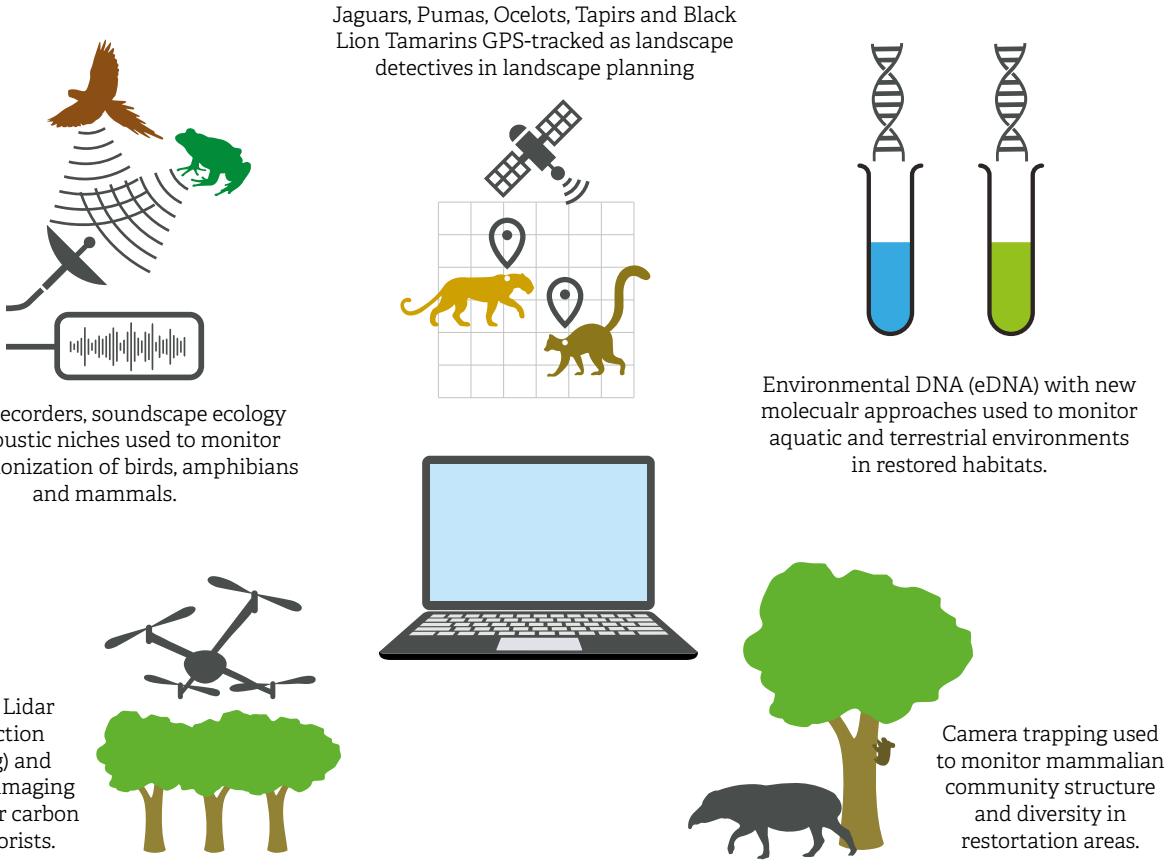

Figure 15.3. Use of different and innovative technologies in ecosystem services monitoring developed by IPE in the Pontal do Paranapanema.[66]

drones, camera traps and tape recorders with the sounds of the animals being studied and Light Detection and Ranging (LIDAR). These innovations have been introduced as they became available over time, and are valuable to the data collection, and thus to the overall outcomes of the research conducted. Therefore, there has been a refinement of different techniques, and evaluation has been key to indicate where success occurs and where adjustments are needed (Figure 15.3).

Key benefits: The area-based conservation approach adopted for the Morro do Diabo State Park and the Black Lion Tamarin Ecological Station aims to ensure that everyone benefits over time: the natural habitats are enriched and restored while local people are trained in arboricultural techniques and tree-planting, which generally provide for additional incomes, as do handicrafts focusing on local nature, both helping the communities to become more aware of the importance of protecting nature. IPE has worked with over 400 families and the demand for cooperation is increasing, with a priority for working with those who inhabit lands adjacent or near to the protected areas or to remaining natural forests. The restored forests also act directly in mitigating the effects of climate change, supporting in particular water provisioning, water and soil quality, and crop protection. Research is often conducted on the flora and fauna, water and soils. This improves the understanding of environmental benefits associated with forest ecosystems, helping to empower communities to receive support.

Lessons learned: Climate change is a reality and forests play a key role in minimising its effects. When forests are present, water is abundant and of good quality, floods do not often happen because of the natural coverage, the soil is rich and fertile, and the air is pure. Agriculture and other human activities flourish. This has been recognised by local people, especially those involved in reforestation. There were complaints about environmental degradation and its effects and local people are now expressing how the forests are making a difference in many aspects.

Key lessons learned include:

- Area-based conservation can support not only species conservation but also broader long-term wellbeing and sustainability in the region. However, area-based conservation approaches need to take into consideration the landscape as a whole, and act based on a broad plan to be implemented step-by-step with a long-term vision; conservation is a complex field and the team of professionals engaged must be willing to work in an interdisciplinary and cooperative way;
- Conservation actions and initiatives are more likely to be successful if they are science-based (long-term research) and integrate social, environmental and economic aspects;
- Local people should be involved right from the project's conception and empowered to solve problems and contribute to solutions that often they themselves bring about;
- The outcomes are not always the expected ones, so adaptive management is crucial to guarantee that adjustments are made during project implementation;
- Evaluation should occur at all stages of a project's implementation, in order to avoid discovering mistakes only in the final phase.

Next steps: More forests need to be planted everywhere the "Dream Map" has identified as important. Reforestation is needed within protected areas, around forest fragments, forming a buffer of protection that promotes a natural expansion of the forest fragments, and in forest corridors to restore connectivity among the remaining fragments. IPE's aim as such is to increase native forest protection and available habitats for the regional fauna, especially for the black lion tamarins and others that do not dare leave the forests. The "Dream Map" prioritises areas that need immediate action and others that can go at a slower pace. Much has been done, but more corridors and buffers must be planted to increase the protection that healthy and thriving rivers and forests can provide to mitigate the effects of climate change and other numerous deleterious consequences of unsustainable human actions.

Case study

Private conservation of remnant forest ecosystems to support sustainable development

Grand Bois Privately Protected Area, Haiti

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Co-benefit SDGs

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Background: Haiti's biodiversity is threatened by the almost complete loss of primary forest cover, which has been reduced by some estimates to approximately 0.3 per cent of the original;[67] one of the highest losses in the tropics. Forests have continued to be destroyed even within national parks and 42 out of the 50 highest mountains have lost all their primary forest.[68] Even taking into account technical concerns disputed among experts,[69] less than one per cent of primary forest remains, placing biodiversity in peril.[70] Deforestation has already caused the extinction of endemic species, by inference, and many more species are under severe threat.[71]

Sustainability challenge: The primary pressures include smallholder agriculture and charcoal production.[72] There are larger areas of secondary forests and plans for reforestation,[73] but any forests other than primary forests will support only a small fraction of the original biodiversity. Some timber use, including some charcoal production,[74] may be sustainable, but the critical conservation priority is to preserve the fragments of primary forests that remain, where many of the endemic species are concentrated.[75]

One of the most important remaining forest areas is on the isolated Grand Bois mountain, with substantial forest cover remaining above a thousand metres.[76] Two research expeditions documented 68 species of vertebrates, including 19 amphibian species, giving this area the distinction of being home to one of the largest groupings of co-occurring frog species anywhere in the Caribbean.[77] Grand Bois is found in Haiti's Massif de la Hotte mountain range, the number one priority conservation site in the country and one of the most important sites for amphibians in the world.[78] Because 19 Critically Endangered amphibian species are restricted to this single area globally,[79] Massif de La Hotte has been recognised as an Alliance for Zero Extinction site,[80] and probably has the world's largest number of

Case study

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known AZE species in a single site.[81] It is also within a Key Biodiversity Area, a nationally identified site of global significance for biodiversity.

Conservation solution: The NGO, Global Wildlife Conservation, has partnered with Rainforest Trust and the local NGOs, Haiti National Trust and Audubon Society of Haiti, to buy the country's first privately protected area on Grand Bois in 2019. The new reserve broadly overlaps with the newly declared Grand Bois National Park, established by the Haitian government in 2015, but where logging was continuing and new approaches were urgently needed. The privately protected area covers about 5 km² including a core of primary forest, offering protection to several rare species found nowhere else on Earth. These include the Critically Endangered Ekman's magnolia tree (*Magnolia ekmanii*), known only from Grand Bois, and the Tiburon streamfrog (*Eleutherodactylus semipalmatus*), until a recent expedition, thought to have been long extinct.

The forest was already being protected to some extent by local people, who recognised its role as a water tower and a means of preventing the landslides that have proved deadly in large parts of the island. There is local community support for conservation of the area, and continued work on long-term restoration around the site. By purchasing the site directly, and employing local people as rangers, the Haiti National Trust is hoping to secure biodiversity, provide disaster risk reduction and water services to local and more distant communities, and also prevent further losses of unique biodiversity.

Endnotes

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