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Developing capacity for a protected planet

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protected planet

IUCN PROTECTED AREA DEFINITION, MANAGEMENT CATEGORIES AND GOVERNANCE TYPES

IUCN defines a protected area as:

A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.

The definition is expanded by six management categories (one with a sub-division), summarized below.

Ia Strict nature reserve: Strictly protected for biodiversity and also possibly geological/ geomorphological features, where human visitation, use and impacts are controlled and limited to ensure protection of the conservation values.

Ib Wilderness area: Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, protected and managed to preserve their natural condition.

II National park: Large natural or near-natural areas protecting large-scale ecological processes with characteristic species and ecosystems, which also have environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.

III Natural monument or feature: Areas set aside to protect a specific natural monument, which can be a landform, sea mount, marine cavern, geological feature such as a cave, or a living feature such as an ancient grove.

IV Habitat/species management area: Areas to protect particular species or habitats, where management reflects this priority. Many will need regular, active interventions to meet the needs of particular species or habitats, but this is not a requirement of the category.

V Protected landscape or seascape: Where the interaction of people and nature over time has produced a distinct character with significant ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.

VI Protected areas with sustainable use of natural resources: Areas which conserve ecosystems, together with associated cultural values and traditional natural resource management systems. Generally large, mainly in a natural condition, with a proportion under sustainable natural resource management and where low-level non-industrial natural resource use compatible with nature conservation is seen as one of the main aims.

The category should be based around the primary management objective(s), which should apply to at least three-quarters of the protected area – the 75 per cent rule.

The management categories are applied with a typology of governance types – a description of who holds authority and responsibility for the protected area.

IUCN defines four governance types.

Governance by government: Federal or national ministry/ agency in charge; sub-national ministry/agency in charge; government-delegated management (e.g. to NGO)

Shared governance: Collaborative management (various degrees of influence); joint management (pluralist management board; transboundary management (various levels across international borders)

Private governance: By individual owner; by non-profit organisations (NGOs, universities, cooperatives); by for-profit organsations (individuals or corporate)

Governance by indigenous peoples and local communities: Indigenous peoples' conserved areas and territories; community conserved areas – declared and run by local communities

For more information on the IUCN definition, categories and governance type see the 2008 *Guidelines for applying protected area management categories* **which can be downloaded at: www.iucn.org/pa_categories**

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IUCN-WCPA's Best Practice Protected Area Guidelines are the world's authoritative resource for protected area managers. Involving collaboration among specialist practitioners dedicated to supporting better implementation in the field, they distil learning and advice drawn from across IUCN. Applied in the field, they are building institutional and individual capacity to manage protected area systems effectively, equitably and sustainably, and to cope with the myriad of challenges faced in practice. They also assist national governments, protected area agencies, nongovernmental organisations, communities and private sector partners to meet their commitments and goals, and especially the Convention on Biological Diversity's Programme of Work on Protected Areas.

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PARKS is published electronically twice a year by IUCN's World Commission on Protected Areas. For more information see: www.parksjournal.com

PARKS is published to strengthen international collaboration in protected area development and management by:

- exchanging information on practical management issues, especially learning from case studies of applied ideas;
- serving as a global forum for discussing new and emerging issues that relate to protected areas;
- promoting understanding of the values and benefits derived from protected areas to communities, visitors, business and others;
- ensuring that protected areas fulfill their primary role in nature conservation while addressing critical issues such as ecologically sustainable development, social justice and climate change adaptation and mitigation;
- changing and improving protected area support and behaviour through use of information provided in the journal; and
- promoting IUCN's work on protected areas.

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PARKS: THE INTERNATIONAL JOURNAL OF PROTECTED AREAS AND CONSERVATION

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EDITORIAL

Marc Hockings, Managing Editor

The SARS-CoV-2 pandemic continues to wreak havoc around the world and it is clear that we will be living with this virus for some time to come. We published a Special Issue of PARKS on the impacts of COVID-19 earlier this year thanks to the dedication and hard work of the special issue editors, Adrian Phillips and Brent Mitchell. It brought the contributions of over 160 authors to provide the most comprehensive picture yet of the impacts on the pandemic on protected and conserved areas. The cost in terms of human lives and livelihoods is overwhelming.

The pandemic has also led to significant disruption to the global conservation policy development agenda. As we go to press, the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) and the Subsidiary Body on Implementation (SBI) of the Convention on Biological Diversity are meeting virtually to develop final proposals for the Post-2020 Biodiversity Framework. It remains unclear whether a physical meeting of the Conference of the Parties will be able to be held in Kunming, China later this year to discuss and adopt this Framework.

The Editorial Essay in this issue of PARKS, sets out progress that was made towards Aichi Target 11 - arguably the most successfully implemented of the Aichi Targets and lays out the thinking towards even more ambitious and necessary targets going forward.

The achievements over the past decade are remarkable! As the recently released Protected Planet Report for 2020 (https://livereport.protectedplanet.net) sets out, since 2010 protected areas covering almost 21 million km^2 have been added to the global estate. This represents 42% of the current coverage of protected and conserved areas around the world.

This has been the result of collective efforts of governments, local and Indigenous communities, NGOs, civil society and all who have advocated for the protection and better management of our world. There have been few stronger or more passionate advocates for this quest than Sarat Babu Gidda from the Secretariat of the Convention on Biological Diversity. Sarat is our Aichi Target 11 Champion. As all who have received his regular and multi-coloured emails reporting on progress towards Target 11 can attest, Sarat has lived and breathed the cause of protected and conserved areas throughout this journey since 2010. He has published regularly in PARKS on issues around global targets for protected and conserved areas.

Earlier this year, Sarat's passion, commitment and achievements were recognised by WCPA through his selection as one of the 2021 Fred Packard Award recipients for his exceptional service to protected and conserved areas.

Sarat has now retired from his position as Head of the Biodiversity Science, Policy and Governance Unit in the Secretariat of the Convention. We all owe him a great debt of gratitude and it is fitting that we acknowledge his contribution here.
Thank you, Sarat!

Sarat Babu Gidda at CBD COP, Cancun, Mexico © Jamieson Ervin

EDITORIAL ESSAY: PROTECTED AND CONSERVED AREAS: CONTRIBUTING TO MORE AMBITIOUS CONSERVATION OUTCOMES POST -2020

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ABSTRACT

In 2010, Parties to the Convention on Biological Diversity (CBD) adopted Aichi Biodiversity Target 11, committing to conserve, by 2020, at least 17 per cent of terrestrial and inland waters and 10 per cent of coastal and marine areas through systems of protected areas and other effective area-based conservation measures (OECMs). Once national data are updated it is expected that Parties will have met the coverage elements of Target 11, especially as more OECMs are reported. There is still, however, more effort needed to address equitable governance, effective management, ecological representation, connectivity and other quality elements of the target. Post-2020 momentum is growing to adopt more ambitious global targets of at least 30 per cent of terrestrial, freshwater and marine ecosystems protected by 2030 to halt biodiversity loss. This will require a three-pronged approach: creating new protected areas focussed on areas important for biodiversity; improving management and governance to ensure that existing and new protected areas are effective; and recognising and supporting OECMs. The substantial expansion of protected areas over the last decade, new opportunities to recognise OECMs, and increasing recognition of effective protected and conserved areas as nature-based solutions to climate change and other global challenges, all give reasons for optimism for making even greater progress by 2030 towards the CBD 2050 Vision of Living in Harmony with Nature.

Key words: biodiversity outcomes, global targets, OECMs, nature-based solutions

In 2010, Parties to the Convention on Biological Diversity (CBD) adopted Aichi Biodiversity Target 11, committing to conserve, by 2020, at least 17 per cent of terrestrial and inland waters and 10 per cent of coastal and marine areas through systems of protected areas and other effective area-based conservation measures (OECMs) (CBD, 2011). The fifth Global Biodiversity Outlook, based on 2019 data, reported 15 per cent of land areas and almost 8 per cent of the ocean were under designated protected areas (SCBD, 2020). By the end of the UN Decade on Biodiversity (December 2020), countries had reported further progress on protected area establishment and it is expected that Parties will have met the coverage elements of Target 11 (with implications also for some of the other elements of the target) once all the data are collated and updated in the World Database on Protected Areas. Further gains will be made as more OECMs are recognised and reported.

Since 2010 there has been a remarkable expansion of protected areas – more than 21 million square kilometres of new and expanded terrestrial and marine sites; thus 42 per cent of the current coverage, an area equivalent to almost three times the land mass of Australia, has been added in the last decade (UNEP-WCMC 2021). The expansion of marine protected areas (MPAs) during the last five years has been especially noteworthy with some very large MPAs already established and more proposed including large areas in French Polynesia[1] in the Pacific and a new Southern Atlantic MPA extending over 690,000 sq. km around the island of Tristan da Cunha[2]. The latter is almost three times the size of the United Kingdom.

While there has been substantial progress in expanding the number and area of protected areas, there is, however, still some way to go in improving governance and management effectiveness and other quality elements included in Aichi Target 11 (Gannon et al., 2019).

As more protected areas are established and more OECMs are recognised and reported, we can expect further increases in levels of ecological representation, connectivity, and coverage of areas important for biodiversity and ecosystem services. For example, an analysis of 740 terrestrial Key Biodiversity Areas in ten countries found that 76 per cent of those containing no protected areas were at least partly covered by potential OECMs (Donald et al., 2019).

Achieving the coverage elements of Target 11 during the UN Decade of Biodiversity has established a good foundation for more ambitious global targets in the post-2020 global biodiversity framework currently being negotiated by Parties to the CBD for approval at the fifteenth Conference of the Parties (COP15). Many countries are calling for protection of at least 30 per cent of the planet across terrestrial, freshwater and marine habitats by 2030 to halt further biodiversity loss and begin to reverse the trend.

To achieve more ambitious conservation targets, we need a three-pronged strategy to expand the protection of remaining natural habitats, including:

1. Creating additional protected areas, focusing especially on areas that are important for biodiversity; without such a focus, an increase in coverage alone will not be sufficient to meet biodiversity goals and greater ecological representation.
2. Ensuring that existing and new protected areas are well-protected, well-managed and well-governed to ensure effective biodiversity outcomes.
3. Recognising, reporting and supporting other-effective area-based conservation measures.

Each of these will require the full and effective participation of indigenous and local communities and recognition of their rights as well as greater engagement with private landholders (Maxwell et al., 2020).

More effective protected areas

Protected areas are widely recognised as one of the most effective ways to conserve biodiversity and reduce loss of forests and other natural habitats (Watson et al., 2014; Woodley et al., 2019; MacKinnon et al., 2020). While countries have made good progress in expanding coverage especially in terrestrial ecosystems, freshwater habitats are still much less well represented in protected area networks. In addition, many designated marine protected areas (MPAs) have little or no effective protection or management. Indeed, it is estimated that at present only 2.7 per cent of the ocean is highly protected, with many MPAs subject to unsustainable fishing and other extractive uses (Sala et al., 2021). Well-managed MPAs are an effective tool for restoring ocean biodiversity and ecosystem services; a substantial increase in ocean protection could provide multiple benefits, boosting fishery yields and secure marine carbon stocks as well as protect marine biodiversity (Sala et al., 2021).

The proposed CBD targets in the post-2020 global biodiversity framework are not just about designation but also effectiveness; the current proposed Target 2 emphasises effective systems of protected areas and OECMs (CBD, 2020). Unless protected areas are effective in sustaining long-term biodiversity outcomes, they will achieve little in halting biodiversity loss.

Moving forward, it is essential to address the issues of 'paper parks' and ensure that all protected areas are effectively protected and managed to deliver biodiversity outcomes. The IUCN Green List of Protected and Conserved Areas is the first global sustainability standard describing key elements of quality for area-based conservation (Hockings et al., 2019). The standard recognises that good governance, sound design and planning and effective management are all necessary to deliver successful conservation outcomes. The Green List standard provides a useful framework for strengthening management effectiveness in protected areas of all categories and under all types of governance.

Other effective area-based conservation measures (OECMs)

While strengthening the management of protected areas is important, the recognition and support of OECMs – areas already delivering effective biodiversity conservation long term – will be essential to achieving more ambitious conservation targets by 2030. The CBD adoption of criteria on OECMs in 2018 provides a great opportunity to recognise areas under a wide range of governance and management regimes, including government, private sector, Indigenous Peoples, and communities, which deliver effective in situ conservation of intact ecosystems and important biodiversity (IUCN/WCPA, 2019). Potential OECMs may include some Indigenous and Community Conserved Areas (ICCAs) and Locally Managed Marine

Torngat Mountains National Park Photo: H. Wittenborn © Parks Canada

Areas (LMMAs), as well as areas managed by government and the private sector. While OECMs do not need a primary conservation objective, they must deliver effective long-term conservation of important biodiversity (IUCN/WCPA, 2019). It will be important to understand why such areas are effective in maintaining biodiversity so that appropriate support can be provided to help maintain those values. This may require a range of mechanisms depending on the actors involved, but could include ensuring greater security of land tenure, access and use rights for Indigenous Peoples, provision of economic incentives such as payments for ecosystem services or better integration of biodiversity values into spatial planning and practices in production sectors.

It has been estimated that 37 per cent of all remaining natural lands on the planet are traditionally owned, managed, used or occupied by Indigenous Peoples (Garnett et al., 2018). These lands contain about 13 per cent of all carbon stored in terrestrial ecosystems and make up about 35 per cent of the total area that is formally protected (Diaz et al., 2019; Garnett et al., 2018). Increased appreciation of the role of Indigenous Peoples in conservation and formal recognition of OECMs could result in better land management that protects carbon, biodiversity and the cultural values important to indigenous communities (Dinerstein et al., 2019; Maxwell et al., 2020).

Protected and conserved areas as nature-based solutions to climate change

There is increasing evidence that the climate crisis and the biodiversity crisis are so intricately entwined that neither can be effectively addressed without attention to the other (Diaz et al., 2019; Smith et al., 2019). The current COVID-19 pandemic further highlights the need for improved environmental management, better land management and the need for coordinated actions across sectors (Hockings et al., 2020). The urgency of addressing these crises requires a new focus on the role of protected and conserved areas, not only as places to conserve biodiversity, but also as a means to maintain intact ecosystems, prevent further land degradation and maintain ecosystem services, including natural carbon sinks and stores (Dinerstein et al., 2019; MacKinnon et al., 2020). IPBES notes that expanding and

strengthening of ecologically representative, well-connected protected area networks and other effective conservation measures (OECMs) is one of a few policies that can address the challenges of biodiversity loss and climate change simultaneously (Diaz et al., 2019). Furthermore, protected areas have been estimated to store about 12 per cent of terrestrial carbon stocks and to account for about 20 per cent of the carbon sequestered annually by all land ecosystems (Smith et al., 2019). Conservation of carbon-dense ecosystems such as peatlands, wetlands, rangelands, mangroves and forests has an immediate impact, whereas other actions such as restoration can take decades to deliver measurable results (IPCC, 2019). As the UN Decade on Ecosystem Restoration begins, there is, however, a need to use ecosystem restoration in strategic ways to reverse biodiversity losses in – and between – protected and conserved areas, to restore habitats, enhance connectivity and strengthen ecological networks.

Rapid climate change and other global challenges underscore the need for better synergies between national actions under the CBD, UNFCCC and UNCCDD. Natural climate solutions, including enhanced protection of areas important for climate change mitigation and adaptation, was a central theme at the UNFCCC COP25 in Madrid. Revisions to Nationally Determined Contributions (NDCs) to the Paris Agreement provide the mechanism by which countries can enhance their ambition on climate change through increased protection and improved management of carbon-dense, high biodiversity ecosystems (Smith et al., 2019). Large tracts of intact carbon-dense ecosystems remain in high biodiversity regions such as the Amazon Basin, Congo Basin, Southeast Asia, as well as in boreal and tundra ecosystems (Dinerstein et al., 2019) .

Gwaii Haanas National Park Reserve and Haida Heritage Site
Photo: S. Fung © Parks Canada

Several countries, including Madagascar and many in South America, are already including expansion and improved management of protected areas as nature-based climate solutions. Colombia, for example, committed to expand its protected area network by 250 million hectares as a contribution to addressing climate change (MacKinnon et al., 2020). Increased recognition of the values of nature-based solutions to climate change could be particularly useful for promoting restoration and conservation of wetlands, peatlands and coastal marine ecosystems that store large amounts of carbon.

Many protected areas are already contributing towards several of the Sustainable Development Goals including food and water security, disaster risk reduction and protecting human health. The COVID-19 pandemic has highlighted the important, yet complex, relationship between protected areas and human health benefits. It is clear that protected areas conserve ecosystems, prevent habitat fragmentation, minimise edge effects and protect wildlife, all benefits that reduce the likelihood of exposure and transmission and spread of zoonotic diseases (Hockings et al., 2020; Reaser et al., 2021). It is also encouraging to see that countries as diverse as Canada, Pakistan and New Zealand are already looking to strengthen their protected area networks as part of greener economic stimulus packages after the COVID-19 pandemic (Golden Kroner et al., 2021).

Target 11 has been one of the most successful elements in the Strategic Plan for Biodiversity (Woodley et al., 2019) and momentum is growing to adopt much more ambitious global targets for protected and conserved areas. The priority is now to ensure that protected areas are effectively and equitably managed, well connected, and integrated into wider landscapes and seascapes. The success of national efforts to conserve terrestrial and marine areas over the last decade, and new opportunities to recognise and support OECMs, give reasons for optimism for making even greater progress by 2030 towards the CBD 2050 Vision of Living in Harmony with Nature.

ENDNOTES

[1]https://www.codim.pf/wp-content/uploads/2018/06/Projet-dAire-Marine-Prote%CC%81ge%CC%81e-aux-MarquisesCODIM_lowres.pdf

[2]https://www.gov.uk/government/news/worlds-most-remote-island-helps-uk-exceed-protected-ocean-target

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RESUMEN

En 2010, las Partes del Convenio sobre la Diversidad Biológica (CDB) adoptaron la Meta 11 de Aichi para la Biodiversidad, comprometiéndose a lograr en el año 2020 la conservación de al menos el 17 por ciento de las aguas terrestres y continentales y el 10por ciento de las zonas costeras y marinas a través de sistemas de áreas protegidas y otras medidas efectivas de conservación basadas en áreas (OMEC). Una vez que se actualicen los datos nacionales, se espera que las Partes hayan cumplido con los elementos de cobertura de la Meta 11, especialmente a medida que se reporten más OMEC. Sin embargo, sigue siendo necesario redoblar esfuerzos para el abordaje de aspectos tales como la gobernanza equitativa, la gestión eficaz, la representación ecológica, la conectividad y otros elementos de calidad de la meta. Desde 2020 existe un interés creciente en adoptar objetivos globales más ambiciosos de al menos el 30 por ciento de los ecosistemas terrestres, de agua dulce y marinos protegidos para detener la pérdida de biodiversidad de aquí a 2030. A este efecto, será necesario un enfoque en tres direcciones: la creación de nuevas áreas protegidas centradas en áreas importantes para la biodiversidad; la mejora de la gestión y la gobernanza para garantizar que tanto las áreas protegidas existentes como las nuevas sean efectivas, además del reconocimiento y apoyo a las OMEC. La gran expansión de las áreas protegidas en la última década, las nuevas oportunidades para reconocer las OMEC y el reconocimiento cada vez mayor de las áreas protegidas y conservadas efectivas como soluciones basadas en la naturaleza para hacer frente al cambio climático y otros desafíos globales, dan pié al optimismo para avanzar aún más en el logro de las metas establecidas para el año 2030 en términos de la visión 2050 del CDB de vivir en armonía con la naturaleza.

RÉSUMÉ

En 2010, les parties à la Convention sur la diversité biologique (CDB) ont adopté l'Objectif 11 d'Aichi pour la biodiversité, s'engageant à conserver, d'ici 2020, au moins 17 pour cent des eaux terrestres et intérieures et 10 pour cent des zones côtières et marines grâce à des systèmes d'aires protégées et autres mesures de conservation efficaces par zone (AMCE). Une fois les données nationales mises à jour, nous nous attendons à ce que les parties puissent satisfaire aux éléments de couverture de la cible 11, d'autant plus que de nouveaux AMCE seront recensés. Des efforts supplémentaires seront toutefois nécessaires pour mettre en œuvre la gouvernance équitable, la gestion efficace, la représentation écologique, la connectivité et d'autres objectifs de qualité de la cible. L'élan post-2020 prend de l'ampleur en adoptant des objectifs mondiaux plus ambitieux pour protéger au moins 30 pour cent des écosystèmes terrestres, d'eau douce et marins d'ici 2030 afin d'enrayer la perte de biodiversité. Cela nécessitera une approche en trois volets: la création de nouvelles aires protégées axées sur des zones importantes pour la biodiversité; l'amélioration de la gestion et de la gouvernance pour garantir l'efficacité des aires protégées existantes et nouvelles; et la reconnaissance et le soutien apportés aux AMCE. L'expansion substantielle des aires protégées au cours de la dernière décennie, les nouvelles opportunités de recensement des AMCE, et une prise de conscience croissante de l'importance des aires protégées et conservées en tant que solutions fondées sur la nature pour lutter contre le changement climatique et d'autres défis mondiaux, sont toutes autant de bonnes raisons d'être optimistes à propos d'une accélération des progrès d'ici 2030 vers la vision CDB 2050 de vivre en harmonie avec la nature.

EVALUATION OF THE ECOSYSTEM SERVICES PROVIDED BY THE KAILADEVI WILDLIFE SANCTUARY, RAJASTHAN, INDIA

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ABSTRACT

Kailadevi Wildlife Sanctuary (KWLS), in Rajasthan (India), lost its Tiger (*Panthera tigris*) population in 2000, though since 2019 Tigers have over-spilled from the adjacent Ranthambhore National Park (RNP). Though protected, the forests of KWLS are depleted through exploitation by resident and migratory human communities. This study aims to reveal the many societal values generated within KWLS by assessing ecosystem service flows and values on a systemic basis, supported by substantial primary fieldwork. A VALUE+ approach used local interviews, primary fieldwork and literature to determine ecosystem service provision by KWLS, where possible with monetary representation. Conservative values estimated for 21 ecosystem services included: (1) benefit flows of INR 84.47 billion year-1; (2) natural capital stock of INR 367.3 billion; and (3) unquantified ecosystem services. Monetary values are purely illustrative representations largely based on surrogate markets, but nonetheless indicate the range and scale of mainly unappreciated societal benefits. Comparison of KWLS with RNP illustrates differences in service provision between lesser and highly protected ecosystems, including the potential to enhance services such as ecotourism and space for re-established Tiger and other wildlife populations, but also potential disbenefits for those currently extracting resources from KWLS who may become displaced or require compensation.

Key words: Ranthambhore; tiger; livelihoods; Rajasthan; VALUE+

> The forest is a peculiar organism of unlimited kindness and benevolence that makes no demands for its sustenance and extends generously the products of its life activity; it affords protection to all beings, offering shade even to the axe-man who destroys it.
>
> Gautama Buddha

INTRODUCTION

Numbers of Tigers (*Panthera tigris*) in Ranthambhore Tiger Reserve (RTR), Rajasthan state (India), have recovered in recent decades. (RTR comprises Ranthambore National Park as well as the adjacent Sawai Mansingh and Keladevi Wildlife Sanctuaries.) This has resulted in animals formerly occupying the core, highly protected Ranthambore National Park (RNP) moving into the adjacent Kailadevi Wildlife Sanctuary (KWLS). KWLS historically supported Tigers, though its forests were extensively exploited until declared a Wildlife Sanctuary in 1983 and, in 1991, its inclusion in the Tiger Project, Ranthambhore (Kothari et al., 1997). Continuing ecological decline led to the complete loss of Tigers from KWLS by 2000 (Singh & Reddy, 2016). Increasing human and livestock encroachment intensified degradation, social unrest and conflict between local villagers and migratory grazers. The reappearance of Tigers in KWLS from 2011, initially intermittent but later including sightings of a tigress with two cubs in 2018 (personal communication, Forest Department staff) highlights the importance of improving protection of KWLS for Tiger recolonisation.

Enhanced protection can also deliver a diversity of additional societal benefits. For example, India's Tiger Reserves collectively encompass 2.1 per cent of the national area, yet constitute the sources for around 300 rivers, supporting water and food security across substantial downstream areas. Villages established in

and adjacent to KWLS may also potentially benefit from income from tiger tourism. However, there are conflicting views about the different values provided by protected areas. Conservation of ecosystem services is increasingly incorporated into protected area goals, potentially improving co-management for biodiversity and ecosystem services (Floris et al., 2020; Li et al., 2020). A broader focus encompassing ecosystem services can help resolve the interests of people and biodiversity within conservation approaches. However, currently, species richness and regulating services (particularly carbon storage and water yield) are often addressed, though provisioning services are underrepresented in many African protected areas (Wei et al., 2020) and stringent measures in many protected areas can generate inequalities of access to cultural services (Martinez-Harms et al., 2018). Refocusing management of protected areas to include sustainable uses of ecosystem services promoting the development of local communities remains understudied (Zhang et al., 2020), notwithstanding the long-established 'wise use' principle resolving human needs with maintenance of ecological character under the Ramsar Convention (Pritchard, 2018).

Valuation of ecosystem services from six of India's Tiger Reserves (Corbett, Kanha, Kaziranga, Periyar, Ranthambhore and the Sundarbans) using the VALUE+ approach concluded that they provided US$769–2,923 ha^{-1} $year^{-1}$ of quantifiable socio-economic benefits (Verma et al., 2015, 2017). Khanna et al. (2015) and Bhagabati et al. (2014) presented a strong economic case for the conservation of KWLS forest, and Everard et al. (2017) recommended protection of corridor habitats between RNP and KWLS to improve wildlife movement and alleviate wildlife–human conflict. Average monetised ecosystem services benefits of INR 3,300 were calculated for households peripheral to Rajasthan's Sariska Tiger Reserve (Sekhar, 1998). For KWLS to be elevated to a fully protected reserve, it would be necessary to remove substantial human interference. For this purpose, assessment of the diversity of ecosystem services it provides can determine the consequences for overall value, including disbenefits to local stakeholders who may require compensation.

Ecosystem service evaluation is becoming an established method in addition to traditional biodiversity conservation approaches to inform evidence-based policy and management decisions (Lele et al., 2013; Börger et al., 2014). However, economic valuation represents a subset of ecosystem services, many of which remain inherently unquantifiable using financial values (Schmidt et al., 2016). Innovative methods are necessary to address knowledge gaps and to account for less tangible benefits from conservation efforts (Everard & Waters, 2013; Emerton et al., 2006). The IPBES approach (Pascual et al., 2017) recognises that nature is perceived and valued in starkly differing and often conflicting ways by different constituencies, proposing an inclusive valuation of nature's contributions to people in decision-making spanning intrinsic, instrumental and relational values, and addressing power relations among different perspectives. However, this is not without practical difficulties. For example, Ye et al. (2020) proposed an ecosystem intrinsic value (EIV) metric based on such mechanistic factors as exergy and 'eco-energy' to avoid the subjectivity of methods such as 'willingness to pay', but which is at odds with conceptions of the intrinsic value of wild species (Vucetich et al., 2015).

This research is necessary to assess and communicate the diverse values derived from KWLS and their distribution across proximal and more distant stakeholder groups, some of whom may formerly have been overlooked, and how these may inform decisions pertaining to future management. This is important as optimisation of benefits to people as well as wildlife in conservation strategies can identify new incentives and funding sources for biodiversity conservation (Wei et al., 2020). This study follows the VALUE+ approach used by Verma et al. (2015, 2017), deriving conservative estimates for 21 ecosystem services. 'VALUE' denotes economic valuation and '+' reflects where monetisation is currently not possible. VALUE+ is based on the Millennium Ecosystem Assessment (2005) framework of ecosystem services, rather than IPBES or other more recent frameworks. However, this approach is justified as it has been applied not only to the adjacent RNP but also more widely, reflecting high proportions of non-marketed services in the combined total values of services (for example Barua et al., 2020), and also in demonstrating linked socio-ecological costs associated with the recovery of keystone predators (Gregr et al., 2020). Most Indian ecosystem service valuations are based on secondary data and satellite images (Lakerveld et al., 2015; Jadhao et al., 2017; Verma et al., 2015). By contrast, this study uses extensive fieldwork supporting quantitative and qualitative assessment of ecosystem services.

THE STUDY SITE

KWLS (Karauli District, Rajasthan state) lies between latitudes 26°2' N and 26°21' N and longitudes 76°37' E to 77°13' E spanning 672.82 km^2 (Pathak, 2009), 401.63 km^2 of which is defined as critical Tiger habitat of the

RTR (Forest Department, Rajasthan, 2015). Climate is semi-arid with average annual rainfall of 750–800 mm, about 90 per cent falling during the July–September monsoon season, with temperatures of 2 to 15°C in winter (November–February) and exceeding 47°C in summer with frequent droughts (Forest Department, Rajasthan, 2015). KWLS forms the northern boundary of the Ranthambore National Park (RNP) (Figure 1), separated by the Chambal River corridor that forms an important route for animal movements between the protected areas (Thorat & Gurjjer, 2010; Forest Department, Rajasthan, 2015).

The KWLS terrain is characterised by the confluence of the Aravalli Hills and Vindhyan Hills system (Kothari et al., 1997), comprising table-top plateaus ('dang') with parallel ridges forming deep gorges ('khoh') hosting rich forest and soil, high moisture and cooler temperatures. The main khoh in Kailadevi are Nibhera, Kudka, Chiarmul, Ghanteshwar, Jail and Chidi (Das, 2011). Towards the Chambal River, there are 5–8 km wide patches of ravines up to 35–50 m deep (Thorat & Gurjjer, 2010). GIS analysis reveals that 148.28 km^2 is Dhonk forest, 98.83 km^2 is mixed forest in the khoh, 2.42 km^2 is encroached human habitation and 34.24 km^2 is farmland. These forests protect the watershed of the Chambal and Banas Rivers (Forest Department, Rajasthan, 2015; Thorat & Gurjjer, 2010).

Vegetative cover elsewhere in KWLS is relatively sparse. Dhonk (*Anogeissus pendula*) is the dominant tree, constituting 80 per cent of vegetation cover. Forests adjacent to villages and the forest boundary are reduced to stunted shrubs through anthropogenic pressures (Forest Department, Rajasthan, 2015; Thorat & Gurjjer, 2010). Larger fauna includes predators such as Leopard (*Panthera pardus*) and herbivorous prey populations including various deer species. For management

Deep gorges (khoh) host rich, moist forests © Mark Everard

Figure 1. Map of Kailadevi Wildlife Sanctuary (© Tiger Watch)

purposes, KWLS is divided into four Ranges: Kela Devi, Karanpur, Mandrail and Nainiyaki (Forest Department, Rajasthan, 2015).

Rock paintings reveal human occupation of Kailadevi Forest since prehistoric times. Today, KWLS hosts pastoral and agricultural communities substantially dependent on forest resources for their livelihoods. Currently, there are 66 villages in KWLS, each grazing a specific forest area known as a 'kankad'. During and immediately after the monsoon (July–October), people from nearby villages move livestock into KWLS to exploit fresh fodder, forming cattle camps known as 'khirkadi' (Forest Department, Ranthambhore, 2015). Villages inside and peripheral to the forest exert substantial biotic pressure through extraction of timber, fodder and other resources. Wildlife tourism is almost absent due to sparse charismatic fauna and tourism facilities, though many pilgrims visit temples in KWLS.

METHODS

Evaluation methods, both monetary and non-monetary, must be relevant to the context, management need and resources (Turner et al., 2016). We follow Verma et al. (2017), working closely with key stakeholders and experts, interrogating relevant literature and applying value transfer where relevant. Economic valuation techniques have their critics, for example Menon and Rai (2019), specifically criticising the use of VALUE+ applied to India's Tiger Reserves as a neoliberal attempt to hide complex human–nature relationships and the rights of people living within them. We nevertheless outline who the key beneficiaries of services are and the nature of benefits. Methods for assessing ecosystem services spanning broad ecosystem service categories are summarised in Table 1, and elaborated in the Supplementary Online Material.

Table 1. Summary of methods for assessing ecosystem services

Methods use to assess specific ecosystem services
Fodder-related ecosystem services are important to villagers within and adjacent to KWLS as livestock plays an important role in India's economy: Socioeconomic survey: livelihood, community structure and dependencies on agriculture and livestock were recorded by surveying every household in the 66 villages and 20 livestock keepers in every forest Range. Livestock numbers were converted into Adult Cattle Units (ACUs) following Singh *et al.* (1993). Fodder availability: Assessed major sources included leaves of dhonk trees, seasonal grasslands and crop residues, and minor sources included fodder crops, oil cake, weeds in fields, and forage cultivation.
Timber and fuelwood-related ecosystem services, of value to local people within and adjacent to KWLS despite the forests being depleted. Although technically illegal, these benefits are being realised and so are relevant for estimation of the monetary compensation needed for local stakeholders to match the benefits they currently derive from the area: Timber stock: Timber extraction is banned, so timber stock was calculated to illustrate scale of potential value based on random surveys covering three principal types: (1) Tropical Dry Deciduous Forests dominated by dhonk; (2) mixed deciduous khoh (gorge); and (3) ravine scrubland forests, converting to bole volume and converting to economic value following Verma *et al.* (2015). Wood extraction: Though also technically illegal, wood extraction remains a primary fuel source for people living in and adjacent to KWLS. Fuelwood and other biomass (dung cake, agriculture residues, etc.) consumption by villages was quantified in 15% of randomly selected villages.
Carbon stock and sequestration ecosystem services, of value to the global community through climate stabilisation: Carbon stock: Field surveys of tree standing crops in the four forest Ranges informed calculation of above-ground carbon content after Rajput et al. (1996), Limaye and Sen (1956) and (McGroddy et al. 2004), and of below-ground biomass after Ramankutty et al. (2007). Annual grassland carbon sequestration: Grassland productivity assessment was converted to carbon content after Penman et al. (2003).
Soil-related ecosystem services were based on erosion calculated using the Universal Soil Loss Equation (USLE) (Wischmeier and Smith 1978), beneficial to communities downstream in catchments served by KWLS and within the KWLS through productivity: Sedimentation: Assessed by valuation of downstream sedimentation avoidance, based on offset costs of dredging after Verma et al. (2015). Nutrient retention: Assessed using commercial fertilizer replacement costs.
Water-related ecosystem services, beneficial to surface and groundwater users adjacent to the KWLS perimeter including supporting fish production: Water volume within KWLS: Stock value was assessed by extrapolating volumes stored in impoundments within KWLS with average canal irrigation water rates in Rajasthan (Central Water Commission 2017). Water volume outside KWLS: An assumed 50% contribution to water stored in four dams dependent on streams draining from KWLS was multiplied by canal irrigation water rates. Groundwater recharge: KWLS serves as a groundwater catchment vital for adjacent communities, assessed quantitatively and economically based on land cover categories. Fish productivity: Data for fish production in Sawai Madhopur district obtained from FAO (2009) was multiplied by the price of table fish in local markets.
Tourism ecosystem services, beneficial to tourist but with income realized by tourism operators and local involved communities: Travel-cost methods (Clawson and Knetsch 1966) were used to estimate economic value at five religious sites (Ghanteshwar, Kudaka Math, Maheshra Kho, Kailadevi cave, and Kedar-Baba Khoh), infomed by key informant interviews and focus group discussions (FGDs).
Qualitatively described ecosystem services are not inherently monetizable. The relative significance of intrinsic values as well as adjacent pollination and non-timber forest product (NTFP) beneficiaries was informed by literature review, discussions with local and international experts, and community consultations: *Pollination services: Significant for agriculture and food security, but lacking quantitative methods relevant to KWLS.* *Genetic resources: Significant but not inherently quantifiable.* *NTFPs: Diversity and approximate scale extracted from KWLS were assessed based on community surveys.*
Miscellaneous ecosystem services, related generally to intrinsic values as well as local and adjacent beneficiaries of disease and pollination services Inherent values for KLWS gene pool, pollination services, natural pest and disease regulation, atmospheric gas regulation, waste assimilation and provision of habitat for wildlife and refugia were transferred from Verma *et al* (2015).

RESULTS

Ecosystem services quantified and valued or simply recognised qualitatively are documented in the following sub-sections, and described in greater detail in Supplementary Online Material.

Fodder-related ecosystem services

The socio-economic survey revealed seasonally variable grazing, yielding direct benefits to livestock owners (Supplementary Online Material, S1). 80 per cent of villager cattle spend 10 months and feral cattle typically spend 8 months within KWLS, and domestic cattle from nearby villages are brought in from July to October by kirkadis (cattle camps). Total Adult Cattle Unit (ACU) grazing in KWLS was calculated as 50,288.4 requiring (at 6.5 kg per day per ACU) 76,993.72 tonnes year^{-1} fodder.

- Dhonk leaf biomass production was estimated at 9,619.81 tonnes, with total value estimated as INR 19.23 million year^{-1}. Owing to the slow growth of the forest – unlike that of grassland, straw, small-scale cropping and weed harvesting – there is a need to control overharvesting to protect other ecosystem services flowing from forested plateaus.
- Total standing dry above-ground biomass of grassland was calculated as 1.94 tonnes ha^{-1}, a low grassland productivity attributed to heavy grazing and subsequent loss of soil and nutrients. Available grassland fodder dry weight was calculated as 2.480 ha^{-1} year^{-1}, with a total economic value (multiplying by grassland area and INR 4 kg^{-1}) of INR 343.19 million. Grazing pressure is 50 per cent higher than the recommended stocking limit of 1 ACU per hectare (Planning Commission of India, 2011), threatening ecosystem structure, functioning and conservation (Eldridge et al., 2016).
- Straw production was estimated at 11,219.09 tonnes year^{-1} broken down between wheat, paddy and bajra, with a total annual economic value of INR 44.87 million.
- Production of oilcake from mustard (1,056 kg ha-1) and sesame (326 kg ha^{-1}) was calculated as worth INR 6.91 million year^{-1}.
- Green weed production (0.1 tonnes ha-1 year^{-1}) was multiplied by field area in KWLS, deriving a quantity of 284.94 tonnes year^{-1}. Multiplying by a local market price of INR 2,000 tonne^{-1} yields an economic value of INR 0.56 million year^{-1}.
- An average of 2 ha of land cultivated for forage crops in 8 villages implies a total of 16 ha, multiplied by unit kasani production rate (9 kg ha^{-2} year^{-1}) to derive total production of 108 tonnes year^{-1}. Based on local market price of INR 2,400 tonne^{-1}, economic value is INR 0.26 million year^{-1}.

Integrating all sources of fodder supply produced in KWLS provides aggregate annual economic value of INR 415.02 million year^{-1}, though livestock pressures suppress optimum growth of fodder species and wider ecosystem services production including habitat for wild herbivores.

Timber and fuelwood-related ecosystem services

Field sampling of standing wood volume in KWLS and value transfer from Verma et al. (2017) estimates a standing crop of 1,204,542 m^3 with a value of INR 34 billion (Supplementary Online Material, S2).

Though illegal, wood extraction is important for local people for construction and as fuelwood for cooking, heating and the production of mava (condensed milk). Poles are extracted for the construction of houses, barns and cattle sheds, fencing, making agricultural and household tools, and furniture, yielding direct benefits to users. Dhonk is the preferred, durable wood. Household surveys revealed average household use of 10 –12 wooden poles year^{-1}, with the wood volume of 10 poles calculated as 0.159 m^3. Multiplying by the 2,663.75 families within KWLS determined by household surveys, approximately 423.53 m^3 of small timber worth INR 12.01 million is extracted annually.

Field assessment found fuelwood consumption of 7,617.44 tonnes year^{-1}, worth INR 38.08 million, representing an avoided cost for procuring other fuel sources. Socio-economic surveys found that 55 per cent of fuelwood is used for mava-making by communities heavily dependent on cattle but lacking ready markets necessitating conversion to mava and ghee. One kilogram of mava is produced from 4 kg milk, requiring 10 kg wood. An average 2 kg mava day^{-1} is produced by every family, aggregating to 1,710 kg day^{-1} (250 days production annually reflecting seasonal variability). Mava is sold at INR 30 l^{-1}, the same as milk from the local dairy, despite substantial inputs of human labour and fuelwood, representing a loss-making enterprise with substantial negative effects on forest resources. Impact could be limited by: (1) subsidies for dairy collection from remote villages; (2) establishing milk collection centres; or (3) payments for protecting wood resources.

Other fuels used include agricultural residues (considered negligible within KWLS), cow dung cake (only a small level of consumption was found by survey

of 0.65 kg day^{-1} or 237.25 kg year^{-1}), and LPG cylinders (low uptake due to lack of refilling stations and cultural beliefs including taste of food).

Carbon stock and sequestration ecosystem services

Carbon stock and sequestration was quantified in different forest types and grassland in KWLS, represented in monetary values in terms of global socio-economic benefit but lacking direct benefits to local communities (Supplementary Material, S3).

Total carbon in Dhonk forest, based on biomass values from Verma et al. (2015), was 19.99 t C ha^{-1}. An area of 14,828 ha of Dhonk forest therefore stores 0.62 million tonnes carbon, worth INR 493.93 million. Consequently, sequestration potential is 8,748.52 tonnes carbon year^{-1}, with estimated value of INR 6.86 million year^{-1}.

Total carbon in ravine forest was 26.22 t C ha^{-1}, 31.16 per cent higher than Dhonk forest. A total of 3,700 ha of ravine scrubland therefore stores 0.25 million tonnes carbon, worth INR 200.76 million. Sequestration potential is therefore 4,612.8 tonnes of carbon year$^{-1,}$ with estimated value of INR 3.617311632 million year^{-1} transferring sequestration values from Verma et al. (2015). Generally, ravines are considered by planners as 'wastelands', often flattened for agriculture and other uses, yet they provide diverse wildlife habitat, serve as wildlife corridors especially outside protected areas (Khandal & Khandal, 2013) and this study highlights their importance for productivity.

Total carbon in khoh forest was 78.19 t C ha^{-1}, exceeding both Dhonk forest and ravines. Therefore, 9,883 ha of khoh forest stores 1.19 million tonnes carbon, worth INR 936.14 million. Consequently, sequestration potential is 16,899.93 tonnes of carbon year^{-1}, with estimated value of INR 13.25 million year^{-1} based on a social cost of carbon of US$11 tonne^{-1} at 4 per cent discount rate for 2015 (EPA, 2016).

Carbon stock in seasonal grassland was calculated as 1.19 million tonnes, valued at INR 939.77 million. Seasonal grasslands in the KWLS sequester 80.61 tonnes of carbon^{-1}, worth INR 63.21 million year^{-1}. The KWLS seasonal grassland is heavily modified by intensive grazing and tree cutting; habitat protection would increase carbon sequestration and other ecosystem service flows.

Total carbon stock in the KWLS is estimated at 2.08 million tonnes with an economic value of INR 2,570.629 million. Total estimated annual carbon sequestration is estimated at 0.11 million tonnes year^{-1}, with an economic value of INR 86.94 million year^{-1}. Carbon stock and sequestration rates in the KWLS are low compared with studies from similar forest types elsewhere, suggesting heavy pressure from grazing and wood extraction, and taking account of harsh natural conditions.

Soil- and water-related ecosystem services

Soil-related ecosystem service assessments (Supplementary Online Material, S4), beneficial to communities in downstream catchments as well as users of on-site productivity, include:

- Soil retention, which was not directly valued, but informs the economic valuation of avoided off-site costs from sedimentation and nutrient loss.
- Sedimentation avoidance from the KWLS was calculated as 80,621.7 m3 year^{-1} with a total economic value of INR 4.701 million year^{-1}.
- Soil nutrient retention, determined by multiplying soil nutrient concentration with loss avoided (erosion regulation) and multiplying by the costs of alternative fertiliser inputs, yielded an estimated nutrient retention value for KWLS of INR 85.92 million year^{-1} (INR 5.95, 0.43 and 79.54 million respectively for nitrogen, phosphorus and potassium).

Water-related ecosystem service assessments, beneficial to communities in downstream catchments, include:

- Water volume within the KWLS, estimated by adding the cumulative surface area of a small lake known as Pangara (3.26 km^2) and a small additional artificial reservoir retained by a masonry dam located at Kalyanpura (2.1 km^2). This total volume was multiplied by canal irrigation water costs yielded a value of INR 0.16 million. If consumed within a year, this also represents an annual benefit value.

Herd of spotted deer and peacocks in a clearing © Mark Everard

- Water volume in reservoirs outside KWLS but whose waters originate in the park were also valued. These include Needhar dam, the water of which is sourced completely from the KWLS, and a 50 per cent contribution to Kalisil Reservoir, Mamchari Dam and Atewa Dam. Irrigation water from these reservoirs yielded a total estimated economic value from KWLS of INR 0.61 million year^{-1}.
- Groundwater recharge within KWLS was estimated at 40.17 million m^3 year^{-1}, valued at INR 823.16 million year^{-1}.
- Fish productivity in dependent dams was calculated as 34,960 kg year^{-1}, worth INR 0.34 million year^{-1}.

Soil- and water-related ecosystem services provided by KWLS total INR 914.86 million year^{-1}.

Tourism ecosystem services

Focus group discussions revealed approximately 52,980 tourist visits to the five selected temples year^{-1}, most tourists coming from nearby villages and small towns though the Kedar Baba temple is visited by more distant pilgrims (Supplementary Online Material, S5). Aggregated travel costs derived a value of INR 6,894,000 year^{-1}, reflective of how much visitors value visiting the area rather than direct benefits to local stakeholders.

Tourists also exert pressures, including large quantities of plastic waste and contamination of water sources. These pressures require management responses to protect fragile khoh habitats.

Qualitatively described ecosystem services

'Qualitatively described' services include those that relate to the status of the ecosystem and, at least under the Millennium Ecosystem Assessment (2005) framework, may be expressed in biophysical but not monetary terms. Values for pollination, genetic diversity and non-timber forest products could not be quantified in this study (Supplementary Online Material, S6).

2,551.07 ha in the KWLS were found by survey to be under cultivation in the kharif season, with 1,749 ha cropped in the rabi season. Cereal grains dominate and are mostly dependent on wind pollination. Household surveys found a range of kharif and rabi crops benefitting from insect and other pollinators, but no studies relevant to the KWLS ecosystem were available and field experiments could not be accommodated in this study. The pollination service is therefore described qualitatively.

Genetic diversity (gene pool) within any ecosystem represents a rich and co-evolved resource, but no attempt was made to try to assign value to flora and fauna beyond supporting documentation based on rapid surveys of the biodiversity of the KWLS.

Villages and settlements in KWLS are highly dependent on NTFPs including wild fruits (Ber, Grewia, Carandas, etc.), Asparagus roots, Grewia tenax sticks, Ocimum basilicum seeds, gum, medicinal plants and plant fibre. Socio-economic surveys also revealed substantial illegal extraction (poaching) of Asparagus roots, Grewia tenax sticks and Ocimum basilicum seeds by groups of poachers crossing the Chambal River from the neighbouring state of Madhya Pradesh and camping for a number of days to collect these NTFP materials.

Miscellaneous ecosystem services

Table 2 records values for other miscellaneous services provided by KWLS transferred from the Verma et al. (2015) study of the adjacent Ranthambhore division of RNP, correcting for area differences. These six miscellaneous services – gene-pool protection, pollination-related services, habitat for wildlife services, biological control of diseases and pests, aggregated gas

Table 2. Values for miscellaneous ecosystem services provided by KWLS

Ecosystem services	Indicative economic value (transferred from Verma *et al* (2015), correcting for area differences
Gene-pool protection	INR 6,124 million Rupees year^{-1}
Pollination-related services	INR 121.10 million Rupees year^{-1}
Habitat for wildlife services	INR 157.44 million Rupees year^{-1}
Biological control of diseases and pests	INR 44.4 million Rupees year^{-1}
Aggregated gas regulation services	INR 48.44 million Rupees year^{-1}
Breakdown of waste products	INR 484.43 million Rupees year^{-1}
Cumulative value of miscellaneous services provided by KWLS	**INR 6,979.81 million year^{-1}**

regulation services, and breakdown of waste products – have a cumulative value of INR 6,979.81 million year^{-1} (Supplementary Online Material, S7).

DISCUSSION

The assessment of 21 ecosystem services illustrates the systemically interconnected, multiple values provided by KWLS. These include service flows of INR 12.55 million km^{-2} year^{-1}; natural capital stock of INR 367.3 billion; and intangible services without ascribed values. Monetisation is largely illustrative of the range and scale of societal benefits, some of which are tangible for local users of resources whilst others demonstrate more wide-scale indirect benefits to broader constituencies beyond, and sometimes distant from, the park boundary.

Demonstration of this multiplicity and the scale of values are significant for communication of the wider importance of KWLS, consistent with the wider uptake of ecosystem service conservation within protected area goals (Floris et al., 2020; Li et al., 2020). This evaluation highlights the direct benefits from current resource extraction from KWLS that may be curtailed under conservation management, and may therefore require compensation. It also identifies benefits to distal stakeholders, such as users of streams, dams or groundwater peripheral to KWLS, who may not currently recognise themselves as beneficiaries of the protected area.

The comparison of flow and stock values generated by KWLS using primary data with those assessed for the adjacent Ranthambhore division of the RTR based on secondary data (Verma et al., 2015) can provide insights about likely changes in overall benefits and their distribution if KWLS is taken into more stringent conservation management (Table 3). RTR has a strong Tiger population and statutory designation, and has in place better protection and management structure. Differences between values for RTR and KWLS indicate current biotic pressures on KWLS. They also suggest significant potential to increase the capacities of KWLS to support wildlife, potentially enhancing a range of

Table 3. Comparison of assessment of ecosystem services between KWLS (this study) and RTR (Verma et al. 2015)

Services	KWLS, from this study (INR millions yr^{-1}, or INR millions for stock values)	RTR, from IIFM study (INR millions yr^{-1}, or INR millions for stock values)
Study area	**672.8 km^2**	**780 km^2**
Flow services		
Carbon	86.943	63.92
Fuel wood	38.08	Not assessed
Soil loss avoidance	4.7	9.32 (after adjustment of error)
Soil nutrient	85.92	169.3 (after adjustment of error)
Groundwater	823	1,153.7
Water stored	0.74	Not assessed
Fish	0.34	Not assessed
Fodder	415.02	Not assessed
Pollination	121.10	140.4
Gene pool	6,124.01	7,100.00
Habitat	157.44	182.52
Biological control	44.40	51.48
Gas regulation	48.44	56.16
Religious tourism	6.8	Not assessed
Waste assimilation	484.43	561.6
Total flow services	**INR 84.41 billion yr^{-1}**	**INR 94.88 billion yr^{-1}**
Stock services		
Carbon stock	2.570	5.010
Timber stock	34.1	44.190 (after adjustment of the error)
Total stock services	**INR 36.6 billion**	**INR 49.2 billion**

Tiger in cover in Ranthambhore National Park © Mark Everard

ecosystem service benefits across a spectrum of geographical scales whilst also reducing other services.

This information can collectively inform management decisions about KWLS, supporting a business case for greater ecosystem protection. This case may include decisions to exclude damaging human interventions from the park such as the extensive use of the provisioning services of fodder and fuelwood, which appears to compromise soil and biomass carbon sequestration and water-vectored services, for which some degree of compensation or livelihood alternatives may be necessary. Overexploitation of fuelwood for mava-making, which is damaging KWLS forest integrity and functioning while yielding low economic benefits, is one such example for which alternative resources may be identified to support livelihoods more sustainably.

Evaluation of services can also help identify potential novel markets, for example an exploration of payment for ecosystem services (PES) schemes as recently developed in Sanjay Gandhi National Park (Mumbai), and other funding arrangements to justify and encourage novel investment and more equitable sharing of the benefits and costs of conservation (Everard et al., 2020). Enforcement of pre-existing legal prohibitions on resource extraction could better protect and support the regeneration of ecosystem quality and some services, such as potential ecotourism enhancement or water-vectored ecosystem services enjoyed in downstream catchments, though this may disadvantage local communities currently illegally extracting biomass and other assets from within the KWLS. Conservation easements can also provide a means to favour preferential management in both protected and non-protected areas (Benez-Secanho & Dwivedi, 2020). A compromise may include sustainably produced crops or timber from the protected area, and cultural services such as recreation, tourism, research opportunities and maintaining cultural identity, including recognising the importance of spill-over services beyond the protected area (Hummel et al., 2019). Of particular societal importance are the life-support functions of ecosystems, often overlooked historically, yet of increasing importance in an urbanising world of growing human numbers challenged by a changing climate (Ferreira et al., 2019).

Expansion of range for the growing Tiger population is framing consideration of increasing protection for the KWLS ecosystem. If this primary driver is addressed as an 'anchor service' (sensu Everard, 2014) including co-benefits for other top predators such as Caracal (*Caracal caracal*) (Khandal et al., 2020), optimisation of societal values across a range of ecosystem services achieved through a 'systemic solutions' approach (Everard & McInnes, 2013) can better integrate nature conservation goals with generation of multiple, closely linked ecosystem service co-benefits. This strategy is economically rational, contributing to the well-being and prosperity of the large human population dependent on enhanced services deriving from the protection and recovery of the KWLS ecosystem, whilst transparently acknowledging potential trade-offs.

CONCLUSIONS

Recognition and valuation of a broad range of ecosystem services, often overlooked historically, in addition to primary wildlife conservation goals is of increasing importance for protected area management and appreciation.

Ecosystem services assessment represents a significant mechanism for the recognition and valuation of a range of qualitatively differing ecosystem services, including potential conflicts as well as synergies between beneficiary groups resulting from management decisions and actions.

Novel policy mechanisms, such as exploration of payment for ecosystem services (PES) schemes, can justify and encourage investment and more equitably share the benefits and costs of conservation.

Greater protection of the KWLS ecosystem can benefit Tigers and other wildlife with co-beneficial ecosystem service outcomes, though acknowledging disbenefits for communities currently directly and illegally exploiting forest resources.

SUPPLEMENTARY ONLINE MATERIAL

Supplementary details of methods and results
S1 Fodder-related ecosystem services
S2 Timber and fuelwood-related ecosystem services
S3 Economic value of carbon stock and sequestration
S4 Economic value of soil- and water-related ecosystem services
S5 Economic value of tourism
S6 Qualitatively described ecosystem services
S7 Miscellaneous ecosystem services

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RESUMEN

El Santuario de Vida Silvestre de Kailadevi (KWLS, por sus siglas en inglés), en Rajastán (India), perdió su población de tigres (Panthera tigris) en 2000, aunque desde 2019 los tigres han migrado desde el adyacente Parque Nacional de Ranthambhore (RNP, por sus siglas en inglés). Si bien están protegidos, los bosques del KWLS han sido diezmados por la explotación de las comunidades humanas residentes y migratorias. Este estudio pretende revelar los numerosos valores sociales generados en el KWLS mediante la evaluación de los flujos y valores de los servicios de los ecosistemas sobre una base sistémica, con el apoyo de un importante trabajo de campo primario. Un enfoque basado en los valores utilizó entrevistas locales, trabajo de campo primario y literatura para determinar la provisión de servicios de los ecosistemas por parte del KWLS y –en la medida de lo posible– con representación monetaria. Los valores conservadores estimados para 21 servicios de los ecosistemas incluyeron (1) flujos de beneficios del orden de 84.470 millones de INR al año-1; (2) reservas de capital natural de 367.300 millones de INR; y (3) servicios de los ecosistemas no cuantificados. Si bien los valores monetarios son representaciones puramente ilustrativas basadas en gran medida en los mercados sustitutos, indican, no obstante, la gama y escala de los beneficios sociales poco apreciados. La comparación entre el KWLS y el RNP ilustra las diferencias en la prestación de servicios entre los ecosistemas menos protegidos y los más protegidos, incluyendo el potencial para mejorar servicios como el ecoturismo y los espacios para el restablecimiento de las poblaciones de tigres y otras especies silvestres, pero también las posibles desventajas para quienes actualmente extraen recursos del KWLS, que podrían verse desplazados o que podrían requerir una indemnización.

RÉSUMÉ

Kailadevi Wildlife Sanctuary (KWLS), au Rajasthan (Inde), a perdu sa population de Tigres (Panthera tigris) en 2000, mais depuis 2019 des Tigres en provenance du parc national de Ranthambhore (RNP) adjacent ont commencé à se répandre au KWLS. Bien que protégées, les forêts de KWLS ont été ravagées par l'exploitation des communautés humaines résidentes et migratrices. Cette étude vise à révéler les nombreuses valeurs sociétales générées au sein du KWLS en évaluant les flux et les valeurs des services écosystémiques sur une base systémique, appuyée par un important travail de terrain primaire. Une approche VALEUR+ a permis de prendre en compte des entretiens locaux, des travaux de terrain primaires et de la documentation afin de déterminer l'apport des services écosystémiques fourni par KWLS, autant que possible avec une représentation monétaire. Les valeurs conservatrices estimées pour 21 services écosystémiques comprenaient (1) des flux de bénéfices de 84,47 milliards INR par an-1; (2) un capital naturel de 367,3 milliards INR; et (3) des services écosystémiques non quantifiés. Les valeurs monétaires sont purement indicatives et basées en grande partie sur des marchés de substitution, mais elles indiquent néanmoins l'éventail et la portée d'avantages sociétaux encore difficiles à chiffrer. La comparaison du KWLS avec la RNP illustre les disparités entre les services apportés par les écosystèmes les moins protégés et les écosystèmes hautement protégés, notamment leur potentiel pour l'amélioration des services tels que l'écotourisme et l'établissement d'un environnement propice à la population de tigres rétablis et d'autres espèces sauvages, ainsi que des inconvénients potentiels pour ceux qui extraient des ressources de KWLS et qui pourraient être déplacés ou requérir une compensation.

EVALUATING THE IMPACT OF VOLUNTEERS SERVING PUBLIC LANDS

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ABSTRACT

Volunteers fulfil an important role in operating and maintaining public lands and are therefore vital for the healthy function of California State Parks. Due to budgetary restrictions and increased park acreage, volunteers assume roles that have traditionally been held by ranger staff. Many studies focus on volunteer service in the fields of hospital care, social work and municipal administration, yet few have investigated the impact of volunteers serving public lands. To better understand this workforce, we conducted a cross-sectional study using surveys of 176 volunteers and 19 volunteer coordinators for California State Parks within the Santa Cruz District from August to October 2019. Survey questions focused on volunteer efforts in resource conservation, visitor services and daily park operations. Our findings show that volunteers accomplish agency objectives by facilitating interpretive programmes, providing visitor services and performing trail maintenance. In our analysis, three management implications emerged, revealing characteristics of sustainable volunteer programmes: 1) multiple volunteer coordinators per park unit reduces volunteer attrition; 2) recruiting volunteers based on pertinent professional skills maximises volunteer productivity; and 3) reducing volunteer coordinators attrition preserves institutional knowledge and long-term volunteers. By implementing these strategies, public lands agencies cultivate resilient volunteer programmes capable of fulfilling park and staff needs.

Key words: capacity building, management, recruitment, stewardship, state parks, training, volunteer coordination

INTRODUCTION

As volunteer responsibilities in parks expand in breadth and scope, it is important to understand the complex dynamic between volunteers, volunteer coordinators (VCs) and the public lands they serve (Cowan, 2012; CSP Statistical Report, 2018; VIPP Report, 2019). Volunteer programmes and partnerships are important for long-term public lands management, especially with recent budget cuts. Volunteers are generally considered to be a beneficial, and even critical part of the public land workforce (Handy & Mook, 2011; Daniels et al., 2014). However, the extent to which volunteers achieve the mission objectives of the agencies they serve remains unclear.

A pattern of budgetary deficits within the public sector has increased reliance on volunteers to advocate for and protect publicly managed natural and cultural resources (Follman, 2015). Increased park visitation and acreage, and the inability of government to adequately fund parkland public services has promoted alliances and partnerships between the public, non-profit and private sectors (Googins & Rochlin, 2000). As a result, neoliberal management strategies in the public lands sector continue to promote volunteer-dependent organisational structures to compensate for gaps in government staffing (Castree, 2008; Larner, 2003).

It is increasingly important to understand the social, environmental and economic impacts of volunteer efforts. Studies have shown that volunteer programmes have a profound and measurable impact on the healthy function of parks (Daniels et al., 2014; Follman, 2015). The number of California State Parks (CSP) volunteers have been increasing statewide, and provided over 159,000 hours of visitor services, 126,000 hours of trail maintenance and 77,000 hours of natural and cultural resource management in 2017 (VIPP Report, 2019). Studies have found evidence that volunteer programmes foster positive social outcomes such as training a highly skilled and marketable workforce (Classens, 2015; Elias et al., 2016), improved mental and physical health of volunteers (Cnaan & Goldberg-Glen, 1991; Manetti et al., 2015), and increased civic engagement and participation (Ryan et al., 2001; Homana, 2018). Environmental impacts from volunteer programmes

include successful habitat restoration work (Ryan & Grese, 2005; Ganzevoort et al., 2017), contribution to citizen science data collection to influence park management decisions (Ryan et al., 2001; Jordan et al., 2012 Andow et al., 2016), and environmental policy and lobbying efforts (Walton, 2015). Economic impacts from volunteer programmes include offsetting and/or supplementing operational costs of public agencies (Jordan et al., 2012; Manetti et al., 2015), generating profit by providing pay services (Follman, 2015), and fundraising for park programmes and infrastructure improvement projects (Reidy et al., 2005).

Volunteers are a ubiquitous and productive workforce throughout CSP, therefore it is important to understand volunteer roles and responsibilities, characteristics of successful volunteer programmes, and the ability of volunteers to accomplish agency objectives. We examined the benefits and challenges of volunteer programmes serving CSP, identified the patterns and consequences of VC and volunteer attrition, optimal ratios of volunteers to VC, and volunteer recruitment and training standards to improve volunteer programmes and inform long-range park management planning.

Although volunteer work is an important component of the park system, volunteer coordination is often a peripheral responsibility, and commonly listed as 25 per cent of total work time (Interpreter Qualifications, 2019). VCs have many other professional responsibilities outside of volunteer coordination, including leading interpretive programmes, administrative duties (e.g. budgetary, long range planning), and social media management.

Our study focused on all CSP within Santa Cruz District, which includes over 80,000 acres of diverse landscape within 30 individual park units (CSP Statistical Report, 2018). Santa Cruz District is a fitting representation of the statewide park system because of its diverse natural and cultural resources, recreational opportunities, and proximity to urbanised population centres and remote backcountry areas.

CSP is made up of 280 individual park units, 340 miles of coastline, 970 miles of river and lake frontage, 15,000 campsites and 4,500 miles of trails, with over 70 million annual visitors (CSP Statistical Report, 2018). Managing the ecological health and functional operation of widespread, abundant and diverse park units requires a cadre of diligent and consistent volunteers to support the paid park staff. For example, Rancho del Oso – Big Basin Redwoods State Park, a single 1,800-acre park unit along the northern coast of

Volunteer leading an interpretive programme at Rancho del Oso State Park © Jeremy Lin

Santa Cruz, enlists the service of 35 volunteers to support the park interpreter, rangers and maintenance crew (VIPP Report, 2019). In 2017, CSP employed just over 1,600 permanent staff and managed over 36,000 volunteers statewide, averaging 22 volunteers for each permanent CSP staff member (CSP Statistical Report, 2018; VIPP Report, 2019).

In 2017, VCs spent 115,000 work-time hours to facilitate more than 36,000 volunteers to contribute over 1.1 million hours of work within the CSP (VIPP Report, 2019). It is difficult to determine the return on investment (ROI) for volunteer programmes, in part due to differences in agency objectives and inconsistent evaluation models. The uncertainty of volunteer value may be attributed to inaccurate and/or incomplete valuation models used to analyse volunteer efforts (Hackl et al., 2007; Sajardo & Serra, 2011). Few studies have investigated the roles, responsibilities, attitudes and behaviours of volunteers that serve public lands; this is why we chose to explore this topic.

METHODS

Our research focused on the following questions:

1. What are the benefits and challenges associated with volunteer programmes serving CSP?
2. What are the characteristics of highly effective volunteer programmes?
3. Are volunteers being adequately trained?

Online electronic questionnaire surveys were emailed to Santa Cruz State Parks VCs (n=19) and volunteers (n=761) in August 2019 using Google Forms, and were returned by October 2019. In two similar studies, researchers sampled a volunteer population with approximately 200 volunteers (Reidy et al., 2005; Ryan & Grese, 2005). Surveys were emailed to VCs and

volunteers following similar methods used by Dresner (2012). A total of 176 volunteers (out of 761) and all 19 VCs responded to the survey.

We developed two questionnaires—one for paid VCs and another for volunteers—designed to collect demographic data, volunteer and professional work experience, responsibilities and objectives within CSP, and attitudes and confidence in the current volunteer management system (see Supplementary Online Material). Surveys for both VCs and volunteers included demographic questions and structured response questions using a 5-point Likert scale, which were modelled after questions in Dresner (2012), and open-ended questions, modelled after Manetti et al. (2015) and Ryan and Grese (2005). VC attitude questions focused on perceived relevance and effectiveness of the volunteer management system, professional responsibilities and interactions with volunteers. Behavioural questions related to involvement in volunteer recruitment, retention and management. The volunteer survey included attitude questions relating to daily volunteer duties, interactions with VCs and other CSP staff, motivation for volunteering, and obstacles in their service. Behaviour questions investigated volunteer activities, locations and accomplishments.

We conducted comparative analyses of volunteer management practices, representative summary statistics, and an assessment of the real-world implications of volunteer management strategies. We used RStudio statistical analysis software to conduct comparative and correlative tests. We also rated and grouped the qualitative responses from each of the surveys into categories. For example, we classified responses from the following volunteer survey question: "What are the biggest challenges you experience when volunteering for CSP?" into a category list including "park understaffing", "scheduling availability" and "technology".

RESULTS

Volunteer survey

The volunteer survey reached a 23 per cent response rate (n=176) with 109 female and 59 male participants. Volunteers surveyed were 55-74 years old with 79 per cent of participants achieving an education level of bachelor's or advanced degrees. Professional experience among volunteers ranged broadly, with current and previous occupations including firefighter, astrophysicist, software engineer, lawyer and medical worker. (For full details on the complete study, see Lin, 2020.)

When asked, "On average, how many hours per month do you spend volunteering with CSP?", 39 per cent of volunteers reported working over 10 hours each month. Relating to volunteer effectiveness, longer volunteer tenure was significantly correlated with parks that employ more than one volunteer coordinator (Pearson's $r = 0.546$, $p = 1.84e\text{-}11$, $n = 174$), revealing that volunteers stay longer when they are supported by more than one VC. Although 60 per cent of volunteers had over 30 hours of training, many participants wanted additional training on specific subjects including leading interpretive tours, natural history and biodiversity, and using technology. The most common volunteer objectives were roving interpretation, leading scheduled interpretive tours, and providing public safety services (Figure 1). Many respondents listed several volunteer objectives.

Also related to volunteer effectiveness, in response to the question, "Which of your professional skills are most useful in accomplishing these objectives?", 54 per cent of survey participants asserted that "communication" is the most useful skill (Figure 2).

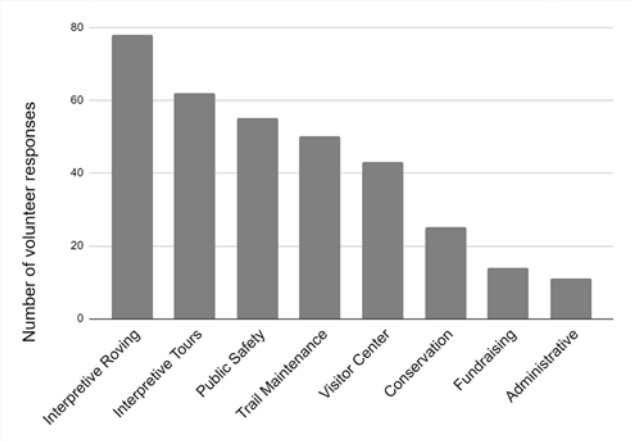

Figure 1. Volunteer objectives

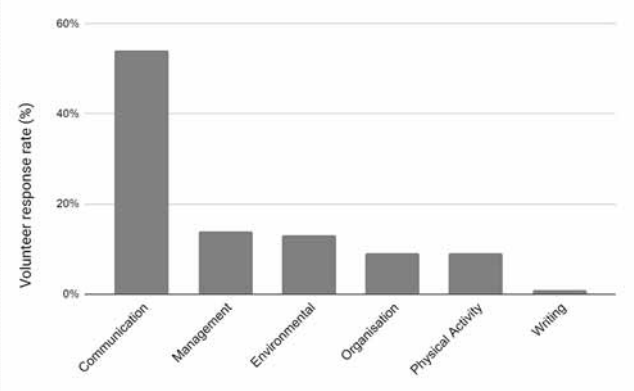

Figure 2. Volunteers' most commonly used professional skills

To answer the research question about benefits from volunteering, when asked about the positive impacts of their volunteer service on parks and visitors, volunteers believed that they contribute most by connecting visitors to nature through interpretive programmes, engaging in stewardship activities, and providing public safety services (Figure 3). Many respondents listed several positive impacts of their work, including stories of meaningful and altruistic interactions, such as: "helping visitors feel the park", "sharing my love for the natural world around me in the hopes that park visitors will also realize the same love themselves", and demonstrating an "open hearted commitment toward public safety".

When asked about the most rewarding aspects and benefits of their service, volunteers were proud to share ideals of environmental stewardship with the public including "to help people, help protect natural resources and occasionally have personal moments of wonder", "feelings of accomplishment, service, gratitude", and "feeling a sense of wholeness that comes from giving back to the parks". Overall, volunteers expressed a great sense of pride in their responsibility to, as one volunteer said, "awaken an understanding and appreciation for the wonders of the natural world", while engaging with park visitors. Volunteers conveyed great joy in their work and feel rewarded by the physical challenge, helping researchers, and purposeful service to public lands. Volunteers appeared to be motivated to engage in meaningful human connections, experience the natural world, and be part of a mission-driven community.

Volunteer Coordinator survey

The VC survey received a 100 per cent response rate (n=19) with 12 female and 7 male participants. The modal age of VCs was 18-24 years old with 79 per cent of participants achieving an education level of Bachelor's or advanced degrees. Professional experience among respondents was fewer than five years of experience as a VC (63 per cent, Figure 4).

Regarding both volunteer training and challenges, the majority of VCs have undergone formal training through CSP yet continue to face challenges. When asked "What are your main challenges in coordinating volunteers?", respondents asserted that they do not have enough time to adequately coordinate their park's many volunteers, struggle with recruiting diverse and fitting volunteers, and would benefit from technology (i.e. database software) to track volunteer information, scheduling and hours.

Our research found that VCs aim to inspire a strong stewardship ethic among volunteers and provide general guidance, support and maintain standards of high quality for interpretive programmes. VCs also see their role as community builders, park managers and frontline representatives of their park.

VCs believe that volunteers are motivated primarily by their personal connection with the parks, the connections that they make with park visitors, and their interest in learning about the natural environment. Respondents mentioned that many of their volunteers have professional experience as educators. The primary responsibilities of volunteers are leading interpretive programmes for public audiences, school groups and other special interest groups (e.g. researchers, environmental groups). Other volunteer duties include public safety service (e.g. patrolling, rules and regulations, medical response), trail maintenance, and natural and cultural resources protection (i.e. habitat restoration).

Sixty-three per cent of VCs surveyed believed that volunteers are very and/or extremely effective in accomplishing their responsibilities and objectives. (Figure 5).

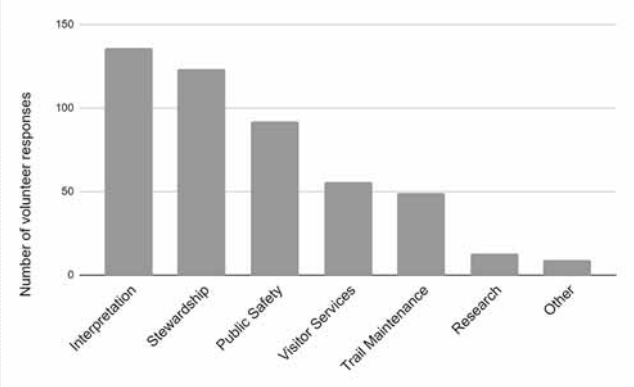

Figure 3. Areas where volunteers feel they make the most positive impact

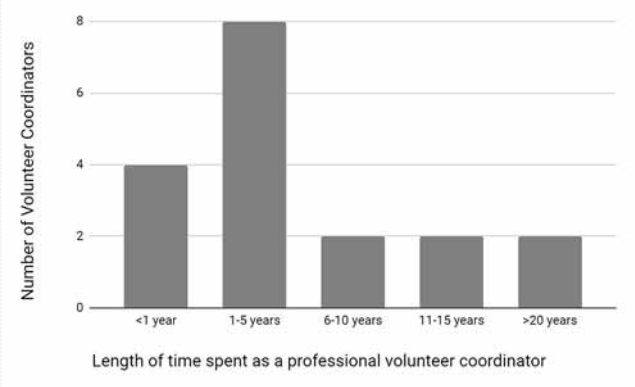

Figure 4. Extent of volunteer coordination experience in years

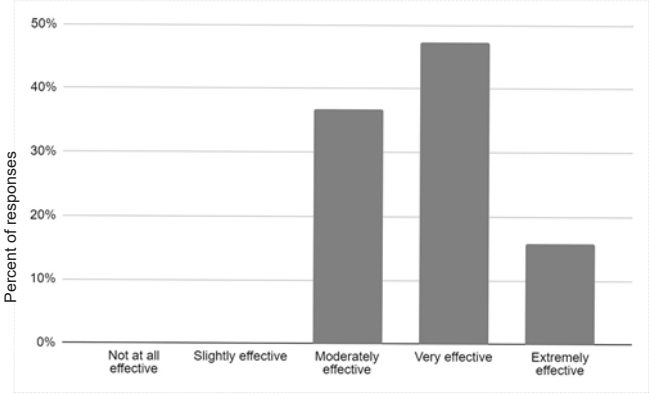

Figure 5. Volunteer Coordinators' confidence in volunteers accomplishing objectives

Many respondents described their volunteer programmes enthusiastically and positively; for example, one VC insisted "Our volunteers are wonderful and committed people who really make the goals of State Parks possible." When asked, "How effective are volunteers in accomplishing their responsibilities and objectives? Explain", VCs often stated that their volunteers' prior and relevant experience and knowledge are the most important factors in supporting their parks' objectives. Other important factors include public speaking, punctuality and personal interest in the park. When asked "Are volunteers being adequately trained/prepared to uphold the standards of California State Parks?", VCs expressed belief that volunteers are well and/or extremely well trained to uphold CSP standards.

When asked to explain how volunteer training could be improved, respondents suggested that offering specialised and/or advanced training (e.g. group management skills, trail tools, technology) may be useful. VCs expressed a need for improved volunteer recruitment strategies, suggesting that park units experience high rates of volunteer attrition and they struggle to fulfil the recurring need for skilled park volunteers.

VCs manage varying numbers of volunteers depending on the scope and size of each park unit, with the most frequent number of volunteers per VC being in the category of between 26-50 volunteers. VCs believed that the optimal number of volunteers under their coordination is between 10-25 volunteers. In addition, VCs spend less than 20 per cent of their work time training volunteers, yet over 30 per cent of work time is spent on coordinating volunteers.

Overall, VCs convey their pride in working with volunteers and express confidence that volunteers are providing a service to the park and community. As one

Volunteers at Wilder Ranch State Park © Jeremy Lin

VC wrote, "Volunteer management is a challenge and a joy...[volunteers] fiercely defend the park, and serve as an inner circle of knowledgeable and caring folks whose reach ripples outward through the whole community." Another VC, with over 5 years of experience articulated that "State Parks would NOT run this successfully without volunteers."

DISCUSSION

Volunteer perspectives

Volunteers bring an array of professional skills to their service including backgrounds in natural science, wilderness medicine and trail work, as observed in other studies (Steimel, 2018; Ganzevoort et al., 2017). In our study, communication was seen as the most practical professional skill brought to volunteer service from the perspectives of both VCs and volunteers.

When asked about obstacles and challenges in service to parks, the issue of park understaffing was frequently mentioned by volunteers, indicating that even if a volunteer base is well qualified and highly skilled, the volunteer programme may be lacking due to inadequate staff numbers. High VC attrition rates contribute to

understaffing because volunteers are often left without a direct line of communication or link to the park system for the extended periods of time it takes to fill vacancies and train new staff. These findings are congruent with a study conducted by Hackl et al. (2007) noting that volunteers are ineffective without clear duty statements and responsibilities.

CSP struggles to recruit and maintain young volunteers, with the majority of volunteers 65 years or older. The trend of older volunteers has been recognised in volunteer demographic studies (Wilson et al., 2017; Elias et al., 2016). This is concerning because the park system relies on an aging population for physically strenuous outdoor tasks including trail work and leading hikes. Parks will benefit from targeting and recruiting younger volunteers.

Our study found that volunteers are adequately trained and prepared to uphold CSP standards. However, additional volunteer training opportunities are necessary to optimise volunteers' ability to accomplish specific park objectives. Many VCs are unable to implement specialised training opportunities due to time constraints. This has consequences for the volunteer workforce, causing volunteers to be less effective in performing specialised tasks. Similar to findings of Liao-Troth (2008), volunteer programmes fail to accomplish agency goals when volunteers are uncertain about their roles and unclear about their specific responsibilities. VCs may consider recording and offering online training seminars, which are less time intensive and may provide volunteers with key knowledge and tools.

VOLUNTEER COORDINATOR REFLECTIONS

Most VCs had fewer than five years of experience in their field, indicating a high rate of attrition. For example, at Wilder Ranch State Park, one VC position has seen four new VCs over the course of three years. This finding underscores the difficulty in maintaining experienced park staff. VC roles are specialised; therefore, frequent staff turnover is detrimental to the park system (Andow et al., 2016; Bembry, 1996). Our study found that VCs are overwhelmed by the large number of volunteers under their coordination and do not have enough time to adequately recruit, train and coordinate their volunteers. Many VCs are only permitted to work part-time, requiring employees to work a second job. Therefore, VCs suggested that professional incentives (e.g. pay increases, full-time positions) would increase their longevity in the profession and improve the volunteer programme, similar to findings of Bembry (1996) in Maryland. Due to the high cost of training VCs, future research should focus on how to address the needs of VCs to improve retention.

VC attrition may also cause problems in recruiting and managing volunteers, as also observed by Hager and Brudney (2011). In this study, researchers found that VCs for public charities across the United States experience higher success in volunteer productivity and retention when they have undergone volunteer management training. In our study, we were surprised that many VCs were unaware of standard tools and technology that are specifically designed to support their work. Interestingly, a quarter of VCs expressed the urgent need for technologies that are not only available, but mandated for use by the park system. This highlights the need for frequent VC training covering technological resources, especially when mitigating high VC turnover rates.

VCs asserted that the optimal number of volunteers under their coordination is 10-25, whereas the actual most common number of volunteers under their coordination is 26-50. VCs struggle to manage large groups of volunteers, with 34 per cent of their total work time dedicated to volunteer recruitment, training and coordination, even though volunteer management is often listed as 25 per cent of total work-time responsibilities (Interpreter Qualifications, 2019). The hiring and incorporation of additional VC positions will not only relieve the overburdened staff, it will allow VCs to manage volunteers and attend to their other professional responsibilities.

We found that VCs believed that a volunteer's prior experience and knowledge are the most important factors in achieving park objectives, reinforcing the findings of Steimel (2018). In this study, researchers evaluated the effectiveness of skills-based volunteering in various professions including dental hygienists, assistant teachers and athletic trainers. Researchers found that skills-based volunteer recruitment enhances the non-profit organisation that they serve.

Similar to findings of Nesbit et al. (2018) and Waikayi et al. (2012), VCs in our study believed that volunteers are well-trained and equipped to perform tasks, however volunteers' success is affected by their prior professional skills and experience. For instance, the public speaking experience of a retired schoolteacher is valuable preparation for leading nature walks with visiting school groups. Also, a volunteer who formerly worked as a hydrologist brings valuable insight and knowledge to restore impaired riparian habitat. Targeted volunteer recruitment to match expertise with park needs is advantageous in maximising agency resources.

What are the benefits and challenges associated with volunteer programmes?

Each park has unique volunteer needs depending on location, natural and cultural resources, and visitor recreation opportunities. Volunteer programmes are equally as diverse and therefore each volunteer programme is specifically designed to accommodate the site needs. Additional challenges include the heavy investment cost to staff VCs (Graff, 2006), frequently recruiting and training volunteers (Hager & Brudney, 2011), and VC and volunteer attrition (Bembry, 1996; Liao-Troth, 2008). However, volunteer programmes provide many beneficial services including meeting public demand for interpretive programmes, restoring natural habitat, maintaining accessible trail systems, and increasing visitor services (Daniels et al., 2014).

In summary, through our survey and literature review research, we concluded that park units experiencing the most benefit from volunteer programmes are those that embody the following characteristics:

- More than one VC staff member dedicated to volunteer recruitment, training and retention (Manetti et al., 2015; Wilson et al., 2017).
- VC(s) with multiple years of professional experience (Vinton, 2012; Studer & von Schnurbein, 2013).
- One volunteer coordinator per 10-25 volunteers (depending on specific park needs).
- Volunteer recruitment strategies based on relevant professional skills and experience (Ellis, 2002; Brudney & Meijs, 2014).
- Volunteer trainings offered regularly, focusing on general responsibilities and specialised skills (Reidy et al., 2005; Jordan et al., 2012).
- VC trainings offered regularly, focusing on tools, technology and volunteer coordination strategies.

Management implications

VCs and volunteers are essential contributors in a variety of ways, including enhancing interpretive programmes, providing visitor services, and maintaining trails and facilities. VCs and volunteers embody a strong personal passion and sense of duty for their service.

Volunteers are sufficiently trained and equipped to perform tasks outlined in their duty statements. However, there are many ways to improve the volunteer management system including employing more than one VC at each park unit, recruiting volunteers with relevant professional skills, and taking steps to reduce VC attrition. Three central themes emerged through our research, which directly address our initial research questions:

1. Employing more than one VC per park unit and maintaining a low ratio of volunteers per VC will reduce volunteer attrition and provide the volunteer

Volunteer Coordinator Jeremy Lin (centre, in brown) with volunteers at Big Basin Redwoods State Park © Jeremy Lin

support needed to accomplish park-specific goals and objectives.
2. Targeting and recruiting volunteers based on pertinent professional skills and experience will maximise volunteer productivity and reduce impact on agency resources.
3. Maintaining experienced, long-term VCs and reducing staff attrition will benefit the park system by protecting institutional knowledge and achieving long-range park management priorities.

We noticed that parks that employ multiple VCs enjoy a higher level of productivity, volunteer morale, and ability to diversify volunteer roles and responsibilities. It is evident that long-term, experienced VCs take advantage of departmental resources and tools, and are respected as leaders among their volunteer base. We also noted that volunteers who join the park system with relevant professional skills can be extremely productive and require less VC attention and training time.

Volunteer programmes represent the community's support and inclusion in the core park mission by protecting extraordinary natural resources and connecting people to meaningful park experiences. In order to secure the future of public lands, it is imperative to acknowledge the extent to which volunteers contribute to parks. Furthermore, public lands agencies that incorporate volunteer tourism as a fundamental management strategy benefit from public involvement in park enhancement activities (Weaver, 2015).

CSP has great potential to benefit from the purposeful management of volunteers through the understanding of volunteer roles and incorporating volunteer programmes into long-range initiatives and planning. Investing in volunteer programmes will result in healthier ecosystems, thriving communities and a more resilient park system. We believe that our study methods and recommendations can be applied beyond just the state of California.

SUPPLEMENTARY ONLINE MATERIAL

Questionnaires used in study

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RESUMEN

Los voluntarios desempeñan un papel importante en el funcionamiento y el mantenimiento de los terrenos públicos y, por tanto, son esenciales para el buen funcionamiento de los parques estatales de California (PEC). Debido a las restricciones presupuestarias y al aumento de la superficie de los parques, los voluntarios asumen funciones que tradicionalmente han sido desempeñadas por el personal de los guardaparques. Muchos estudios se centran en el servicio voluntario en el ámbito de la atención hospitalaria, el trabajo social y la administración municipal, pero pocos han investigado el impacto de los voluntarios que prestan servicio en las tierras públicas. Para comprender mejor esta fuerza laboral, de agosto a octubre de 2019 realizamos un estudio transversal utilizando encuestas de 176 voluntarios y 19 coordinadores de voluntarios (CV) para los PEC dentro del distrito de Santa Cruz. Las preguntas de la encuesta se centraron en los esfuerzos de los voluntarios en la conservación de los recursos, los servicios a los visitantes y las operaciones diarias de los parques. Los resultados obtenidos muestran que los voluntarios cumplen con los objetivos previstos, facilitando programas interpretativos, proporcionando servicios a los visitantes y realizando el mantenimiento de los senderos. En nuestro análisis, surgieron tres repercusiones en el terreno que revelan las características de los programas de voluntariado sostenibles: 1) La asignación de múltiples coordinadores de voluntarios por sector del parque reduce el desgaste de los voluntarios; 2) La contratación de voluntarios con base en las competencias profesionales pertinentes maximiza la productividad de los voluntarios; y 3) La reducción del desgaste de los coordinadores de voluntarios preserva el conocimiento institucional y los voluntarios de larga duración. Mediante la implementación de estas estrategias, los organismos responsables de las tierras públicas desarrollan programas de voluntariado resilientes capaces de satisfacer las necesidades de los parques y del personal.

RÉSUMÉ

Les bénévoles jouent un rôle important dans l'exploitation et l'entretien des terres publiques et sont donc vitaux pour le bon fonctionnement des California State Parks (CSP). En raison des restrictions budgétaires et de l'augmentation de la superficie du parc, les bénévoles doivent assumer des rôles qui étaient traditionnellement occupés par les gardes forestiers. De nombreuses études sont consacrées au bénévolat dans les domaines des soins hospitaliers, du travail social et de l'administration municipale, mais rares sont celles qui se sont penchées sur l'impact des bénévoles qui sont au service des terres publiques. Pour mieux connaître cette main-d'œuvre, nous avons mené une étude transversale à l'aide d'enquêtes auprès de 176 bénévoles et de 19 coordonnateurs bénévoles (CB) pour le CSP dans le district de Santa Cruz d'août à octobre 2019. Le sondage portait sur les efforts des bénévoles dans la conservation des ressources, les services aux visiteurs et les opérations quotidiennes du parc. Nos résultats montrent que les bénévoles atteignent les objectifs de l'agence en facilitant les programmes d'interprétation, en fournissant des services aux visiteurs et en effectuant l'entretien des sentiers. Trois enjeux de gestion se sont dégagés de notre analyse, révélant les attributs qui rendent les programmes de bénévolat durables: 1) De multiples CB par unité de parc réduisent l'attrition des bénévoles; 2) Le recrutement de bénévoles sur la base de compétences professionnelles pertinentes maximise leur productivité; et 3) La réduction de l'attrition des CB préserve les connaissances institutionnelles et retient les bénévoles à long terme. En mettant en œuvre ces stratégies, les agences des terres publiques peuvent développer des programmes de bénévolat résilients capables de répondre aux besoins du parc et du personnel.

THE IMPACT OF THE ESTABLISHMENT OF OTOCH MA'AX YETEL KOOH PROTECTED AREA (YUCATÁN, MEXICO) ON POPULATIONS OF TWO NEOTROPICAL PRIMATES

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ABSTRACT

In 2002, Otoch Ma'ax Yetel Kooh (OMYK) was decreed a federal Flora and Fauna Protected Area in the state of Yucatán, Mexico, resulting in bans on hunting, logging and slash-and-burn agriculture within its limits. Our aim was to evaluate the influence of the establishment of the protected area on local primate populations. We compared relative abundances of Geoffroy's Spider Monkeys (*Ateles geoffroyi*) and Black Howler Monkeys (*Alouatta pigra*) in mature and secondary forest before OMYK was established (in 1998) and 13 years after (in 2015). In both years, the relative abundance of Spider Monkeys was higher in mature than in secondary forest and Howler Monkeys were found exclusively in mature forest. The overall similarity in Spider and Howler Monkey relative abundances over time when mature and secondary forests are considered together is likely because the primates were not hunted and logging was not carried out prior to the establishment of the protected area. Benefits to wildlife of banning slash-and-burn agriculture take longer to become apparent. Still, the legal status of the protected area is critical to defend this site from future land-use changes and it allows the secondary forests to age, thereby increasing habitat for the primate populations.

Key words: *Ateles*, *Alouatta*, conservation, population monitoring, Mexico, reserve

INTRODUCTION

Evaluating the effectiveness of protected areas in maintaining stable wildlife populations is particularly relevant in light of Aichi Biodiversity Target 11, which aimed to protect 17 per cent of the Earth's terrestrial surface and inland waters by the year 2020 (CBD, 2010). Protected areas tend to maintain stable populations of birds and mammals (Geldmann et al., 2013), but these trends are associated with the development level of each country and animal body mass and therefore vary across countries and taxa (Barnes et al., 2016). Commonly, studies compare either animal abundance or species richness of protected areas to areas without protection (often adjacent to the protected areas; Gray et al., 2016), or monitor changes in population size within already established protected areas (Barnes et al., 2016; Brown et al., 2019; Kiffner et al., 2020). Although comparisons of population size of mammal species before and after the establishment of protected areas are uncommon (Wegge et al., 2009), they can provide critical information regarding trends of change, which is particularly relevant in the context of endangered species, and/or aiding in the recovery of highly endangered species (e.g. the Hainan Gibbon (*Nomascus hainanus*), Zhang et al., 2020).

In tropical regions, protected areas are often mosaics of different types of land cover including forests in

differing stages of regeneration, savanna grasslands and woodlands (Arroyo-Mora et al., 2005; DeClerck et al., 2010). This heterogeneous landscape can influence the effectiveness of protected areas in maintaining species populations as they vary per land cover depending on their habitat requirements. This is particularly relevant for many primate species that have highly specialised diets because food availability varies across the landscape (Clink et al., 2017). Evaluation of the success of protected areas in sustaining mammal populations should therefore be assessed per land cover type.

Secondary forests (i.e. forest regenerating after clearance or disturbance; Guariguata & Ostertag, 2001), for instance, differ greatly from mature forests in terms of their structure and species composition, even though some characteristics of older secondary forests may resemble mature forests. Once a plot that was farmed using traditional techniques (e.g. slash-and-burn agriculture) is abandoned, structural complexity may be reestablished within 40–95 years if abandoned agricultural plots are well connected and surrounded by large tracts of mature forest from which seed dispersal is high (Aide et al., 2000; Chazdon, 2003; Read & Lawrence, 2003; Chazdon et al., 2009; Dupuy et al., 2012). Although tree species composition of secondary forests may take hundreds of years to resemble that of mature forests (Aide et al., 2000; Chazdon, 2003), leading to differences in feeding tree availability between mature and secondary forests (Sorensen & Fedigan, 2000; Ramos-Fernández & Ayala-Orozco, 2003), primates are widely reported to use secondary forests (Galán-Acedo et al., 2019).

The benefits to wildlife associated with prohibitions implemented by protected areas with regards to traditional farming techniques (e.g. banning slash-and-burn agriculture) may be slow and indirect, only detectable as the secondary forest reaches late stages of regeneration. Understanding the effects of forest regeneration on primate populations in protected areas therefore requires long-term monitoring. Contrastingly, the benefits of banning extractive activities that directly threaten wildlife abundance (e.g. hunting) or tree species composition (e.g. logging) will directly and rapidly benefit wildlife if well enforced (Harrison, 2011). The aim of our study was to determine the effectiveness of the protected area Otoch Ma'ax Yetel Kooh (OMYK; "the house of the spider monkey and the puma" in Yucatec Maya), located on the Yucatan Peninsula, Mexico, in maintaining stable populations of Geoffroy's Spider Monkeys (*Ateles geoffroyi*) and Black Howler Monkeys (*Alouatta pigra*) by comparing their relative abundance in mature and secondary forests before OMYK was decreed and 13 years after. Both primates are listed as Endangered on the IUCN Red List (Cortes-Ortíz et al., 2020a,b) and Geoffroy's Spider Monkey is one of the 25 most endangered primate species (Méndez -Carvajal et al., 2019).

METHODS

Study area

Otoch Ma'ax Yetel Kooh (5,367 ha; 20°38' N, 87°38' W; 14 m elevation) was decreed as a Flora and Fauna protected area in 2002. Unlike many other federal protected areas in Mexico, OMYK developed out of a community-based initiative, led by members of the local community of Punta Laguna (García-Frapolli et al., 2009). The decree banned hunting, logging and slash-and-burn agriculture (CONANP, 2006). The ban on slash-and-burn agriculture allowed converted forests to regenerate naturally, thereby increasing available habitats for canopy dwelling species as the forest aged (Ramos-Fernández et al., 2018). Neither species of monkey was hunted nor were large trees logged in the mature forest bordering the lake prior to the protected area's establishment.

The protected area consists of patches of semi-deciduous forest surrounded by forest in different stages of regeneration. The area where the primate surveys were performed consisted of 90.1 per cent and 93.4 per cent regenerating forest and 2.2 per cent and 2.6 per cent mature forest in 2003 and 2015, respectively (Bonilla-Moheno et al., in review). OMYK is highly seasonal, with a rainy season from May to October and a dry season from November to April (SMN, 2020). Mean temperatures range from 20.1 °C in January to 26.9 °C in August (SMN, 2020).

Study design

We carried out population surveys of Geoffroy's Spider Monkeys and Black Howler Monkeys in 1997–1998 (hereafter 1998; before the protected area was established) and 2015 (after the protected area was established) in the southern section of OMYK (Figure 1). We surveyed four transects in 1998 and three transects in 2015. The three transects surveyed in 2015 were in approximately the same location as the transects surveyed in 1998. The total length of all transects was 19.6 km in 1998 and 12.5 km in 2015. Most of the transect lengths were in secondary forest: 13.2 km in 1998 (67 per cent) and 7.9 km in 2015 (63 per cent). Each transect was walked between 9 and 31 times (mean ± standard deviation: 19.8 ± 8.4) in 1998 and between 9 and 15 times (11.3 ± 2.6) in 2015.

DATA COLLECTION

For both survey periods (1998 and 2015) we walked transects between 7:00 and 11:00 and between 13:00

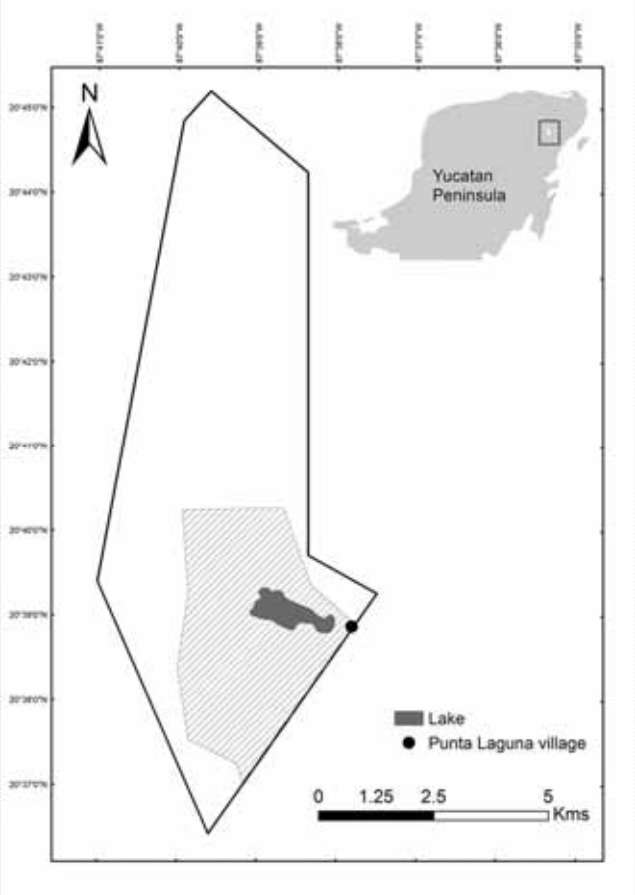

Figure 1. OMYK location. The perimeter of the protected area is represented by the solid black line. The hatched polygon represents the area where surveys were carried out in 1998 and 2015.

and 18:00 at a speed of 1.25–2.0 km per hour. We scheduled transect walks evenly between the morning and afternoon over a full year. On sighting monkeys, we counted all independently moving individuals and marked the location of the sighting using a hand-held GPS device.

Data analysis

We used the encounter rate as a measure of relative abundance (Mitani et al., 2000; Matsuda et al., 2016; Chapman et al., 2018). We calculated the encounter rate by dividing the total number of individuals sighted during surveys by survey effort (total kilometres walked). Instances where monkeys were heard but not seen during transect walks were not considered in the analyses. We calculated encounter rates for the secondary and the mature forest in 1998 and 2015 for each species. We calculated 95 per cent confidence intervals following Meyler et al. (2012) to compare encounter rates of the same species between years and vegetation types. We were unable to calculate 95 per cent confidence intervals for mature forest in 1998 as only one transect included mature forest. Encounter rates are a useful tool for long-term monitoring as they lack the assumptions that may limit the use of population density estimates (Chapman et al., 2018). Encounter rates do not account for the different probabilities of detecting primates due to differences in visibility between secondary and mature forest or differences in observers' ability to detect primates (Chapman et al., 2018). The observers were different individuals between the 1998 and 2015 surveys, but variance in observers' ability to detect primates is usually low (e.g. Chapman et al., 2000).

RESULTS

We walked a similar percentage of transect length in mature forest during each survey period (33.2 per cent in 1998 and 33.3 per cent in 2015). We saw 128 and 83 Spider Monkeys during the 1998 and 2015 surveys, respectively (Table 1). The encounter rate in mature forest for Spider Monkeys in 1998 fell within the 95 per cent confidence interval for 2015 (Table 1). For the secondary forest, the 95 per cent confidence intervals of Spider Monkey 1998 and 2015 encounter rates overlapped (Table 1). Spider Monkey encounter rates in mature forest were above the 95 per cent confidence intervals for regenerating forest in both survey periods (Table 1).

We sighted 37 and 12 Howler Monkeys during the 1998 and 2015 surveys, respectively (Table 2). The encounter

Black Howler Monkey (*Alouatta pigra*) © Fabrizio Dell'Anna

Table 1. Spider Monkey encounter rate (number of individuals per km walked) and 95 per cent confidence intervals (CI) per vegetation type for the 1998 and 2015 surveys.

	1998				2015			
Vegetation type	Distance walked (km)	Number of individuals sighted	Individual encounter rate	95% CI	Distance walked (km)	Number of individuals sighted	Individual encounter rate	95% CI
Mature forest	72.9	102	1.40		42.8	76	1.78	0.51 – 2.11
Secondary forest	146.8	26	0.18	0.04 – 0.31	85.7	7	0.08	-0.05 – 0.15
Total	219.7	128	0.58	-0.13 – 1.09	128.5	83	0.65	0.02 – 1.34

Table 2. Howler Monkey encounter rate (number of individuals per km walked) per vegetation type for the 1998 and 2015 surveys.

	1998			2015			
Vegetation type	Distance walked (km)	Number of individuals sighted	Individual encounter rate	Distance walked (km)	Number of individuals sighted	Individual encounter rate	95% CI
Mature forest	72.9	37	0.5	42.8	12	0.28	-0.12 – 0.38
Secondary forest	146.8	0	0	85.7	0	0	
Total	219.7	37	0.17	128.5	12	0.09	-0.06 – 0.21

rate for Howler Monkeys in mature forest in 1998 was above the 95 per cent confidence interval of the corresponding 2015 encounter rates (Table 2). No Howler Monkeys were seen in secondary forest. When considering both types of forest, the encounter rate for Howler Monkeys in 1998 fell within the 95 per cent confidence interval for 2015 (Table 2).

DISCUSSION

Few studies have compared animal populations before and after the establishment of a protected area (Gormley et al., 2012). Hence, our findings contribute to this important line of research. We found that Spider Monkey relative abundance in mature forest and both Spider and Howler Monkey overall relative abundances (combining mature and secondary forest) were similar before and after the establishment of the protected area. Howler Monkey relative abundance in mature forest was slightly lower in 2015 than in 1998, but only one group of Howler Monkeys was repeatedly detected during the two survey periods.

The stability in overall relative abundances (i.e. when mature and secondary forests are considered together) of both monkey species suggests that OMYK's establishment contributed to the maintenance of these primate populations. It is likely that the 17-year gap between our two surveys is not sufficient to document changes in relative abundances as these species have slow life cycles (Di Fiore et al., 2010). The hunting and logging bans put in place upon the decree of the protected area are unlikely to have affected the Howler and Spider Monkey populations in OMYK because the local community did not hunt monkeys for food or to be kept or sold as pets and did not log trees important to the monkey diets long before the creation of the protected area. Still, the establishment of the protected area had beneficial consequences for the monkeys and other wildlife by providing legal impediments to large-scale developments linked to mass tourism. The legal status of protected areas enables forests to regrow or regenerate in areas that would remain unforested without protection (Andam et al., 2013), thereby contributing to the conservation of wildlife populations that can use these areas. After the decree of OMYK, mature forest and secondary forest > 15 years of age increased in the southern section of the protected area (Bonilla-Moheno et al., in revision), potentially increasing the available Spider Monkey food sources and resting sites as the forest aged (cf. Sorensen & Fedigan, 2000). It is therefore plausible that the overall number of Spider Monkeys will increase over time as forests regenerate naturally, supporting the slower and indirect benefits of banning slash-and-burn agriculture and of protecting areas for biodiversity.

Part of the success of OMYK in protecting primate populations might be due to its origins, in particular the

Geoffroy's Spider Monkeys (*Ateles geoffroyi*) © Denise Spaan

involvement of the local Mayan population (García-Frapolli et al., 2009), which is recognised as a vital component to ensure that protected areas' rules and policies are complied with (Andrade & Rhodes, 2012). For several decades preceding the decree of the protected area, members of the Punta Laguna community profited from a small-scale ecotourism project focused on the Spider Monkeys living in the area (García-Frapolli et al., 2009). After OMYK's establishment in 2003, they formed the cooperative Najil Tucha (the house of the Spider Monkeys), thereby managing ecotourism in a more structured manner (Garcia-Frapolli et al., 2013). As a result, traditional slash-and-burn agriculture was not only abandoned within the protected area, but it was also greatly reduced in the buffer zone surrounding the protected area between 2003 and 2015 (Bonilla-Moheno et al., in revision). This means that areas surrounding the protected area were left to regenerate naturally, increasing the overall habitat available for Spider Monkeys and potentially improving structural connectivity between mature forest patches within and outside of OMYK.

The similarity in overall relative abundances of the two monkey species before and after the protected area's establishment suggests that small-scale slash-and-burn agriculture carried out by the local people within and around the protected area before its decree did not jeopardise primate populations. This is plausible as the Mayan people have practised slash-and-burn agriculture for thousands of years (Jones, 1994) with primate populations living alongside them in many areas. Traditionally, slash-and-burn agriculture practised by Mayan communities surrounding OMYK involved fallow periods of 20–30 years. This way of practising slash-and-burn agriculture may not greatly impact primate populations as Spider and Howler monkeys mostly use mature and secondary forest older than 30 years (Ramos-Fernández et al., 2013). Slash-and-burn agriculture was performed on a relatively small scale in the years preceding the decree of OMYK (Bonilla-Moheno et al., in revision), thereby supporting the view that its impact on primate populations was sustainable. The ban on slash-and-burn agriculture put in place after the protected area's establishment will have long-term impacts on the primate and other wildlife populations by providing more suitable habitat as the forest ages.

Spider Monkeys were sighted in both mature and secondary forests although they were found at higher relative abundances in mature forest compared to secondary forest in both 1998 and 2015. Spider Monkeys living in heterogeneous landscapes therefore use secondary forests, provided there is sufficient mature forest available. The differences we report between

Spider and Howler Monkey relative abundances in mature and secondary forests clearly show the importance of understanding how individual species use the landscape within protected areas over time. Studies like ours focusing on individual species per land -cover type are critical for protected area management to make informed decisions and thereby ensure the maintenance of stable populations.

It may take substantial time for protected areas to have a measurable impact on the abundance of species with slow life cycles, especially when hunting and logging are not the main threats. However, the legal status of the area is likely to have an immediate positive effect by protecting wildlife from negative land-use changes and thus maintaining their populations. Our research also contributes to a growing body of evidence that secondary forests play an important role in mammal conservation and that preserving these forests within and outside of protected areas is vital in protecting populations of arboreal mammal. This can be facilitated when there is community support for protected areas to ensure their long-term success in preserving biodiversity.

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RESUMEN

En 2002, la reserva Otoch Ma'ax Yetel Kooh (OMYK, por sus siglas en inglés) fue declarada como Área de Protección de Flora y Fauna federal en el estado de Yucatán, México, lo que supuso la prohibición de la caza, la tala y la agricultura de roza y quema dentro de sus límites. Nuestro objetivo era evaluar la influencia del establecimiento del área protegida en las poblaciones locales de primates. Comparamos la abundancia relativa de los monos araña de Geoffroy (*Ateles geoffroyi*) y los monos aulladores negros (*Alouatta pigra*) en el bosque maduro y secundario antes del establecimiento de OMYK (en 1998) y 13 años después (en 2015). En ambos años, la abundancia relativa de monos araña fue mayor en el bosque maduro que en el secundario y los monos aulladores se encontraron exclusivamente en el bosque maduro. La similitud general de la abundancia relativa de los monos araña y los monos aulladores a lo largo del tiempo al considerar en conjunto los bosques maduros y los secundarios, se debe probablemente a que los primates no eran cazados y a que la tala de árboles no se llevaba a cabo antes del establecimiento del área protegida. Los beneficios para la fauna silvestre de la prohibición de la agricultura de tala y quema tardan más en hacerse evidentes. Aun así, la condición legal del área protegida es fundamental para defender este sitio de futuros cambios en el uso de la tierra y permitir que los bosques secundarios envejezcan, con el consiguiente aumento del hábitat de las poblaciones de primates.

RÉSUMÉ

En 2002, Otoch Ma'ax Yetel Kooh (OMYK) a été décrété aire fédérale protégée de la flore et de la faune dans l'État du Yucatán, au Mexique, ce qui a entraîné l'interdiction de la chasse, de l'exploitation forestière et de la culture sur brûlis dans cette zone. Notre objectif était d'évaluer l'influence de la création de cette aire protégée sur les populations locales de primates. Nous avons comparé les abondances relatives des singes araignées de Geoffroy (*Ateles geoffroyi*) et des singes hurleurs noirs (*Alouatta pigra*) dans la forêt mature et secondaire avant la création de l'OMYK (en 1998) et 13 ans après (en 2015). Au cours de ces deux années, l'abondance relative des singes araignées était plus élevée dans la forêt mature que dans la forêt secondaire, et les singes hurleurs ont été trouvés exclusivement dans la forêt mature. La similitude générale dans les abondances relatives de singes araignées et de singes hurleurs, lorsque les forêts matures et secondaires sont considérées ensemble, s'explique probablement par le fait que ni la chasse aux primates ni l'exploitation forestière n'avaient lieu avant l'établissement de l'aire protégée. Mais les avantages pour la faune de l'interdiction de l'agriculture sur brûlis mettent plus de temps à se manifester. Néanmoins, le statut juridique d'aire protégée est essentiel pour défendre ce site contre les changements futurs d'utilisation des terres, perme

CONDITION-BASED PROTECTED AREA ZONING TIED TO CONSERVATION PLANNING AND TARGETS

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ABSTRACT

Human use protected area zoning assigns different uses of land and marine resources to different management zones, in theory, to avoid or curtail activities incompatible with management objectives. Despite its global popularity, however, human use zoning generates problems such as the separation of compatible uses and consequent user conflict (e.g., researchers and ecotourists). It allocates more resources to manage human uses than to biophysical conditions that protected areas are charged to conserve. It reduces manifestations of the same use (e.g., intensive and small-scale agriculture) into just one scale of impact. It uses objective criteria to define zones in situations where subjective values may conflict. In response, alternative zoning schemes have emerged, among them, resource condition-based approaches. These, however, tend to be highly technical, poorly evaluated, and show little evidence of adoption by protected area systems, especially in developing countries. This paper therefore proposes a condition-based approach that addresses these weaknesses by using pre-defined conservation targets as the principal criteria to define zones, thus clearly linking conservation planning (such as the Open Standards for the Practice of Conservation) and management zoning. Condition-based zoning focuses on strategic conservation actions with the use of conditions, indicators, standards, and corresponding preventative and corrective management actions, rather than being prescriptive and punitive as with the human use zoning model. Furthermore, the article proposes technology and methodology that are more appropriate for the technical capacity of developing countries. It also traces the development of condition-based zoning from early urban zoning and presents a pilot application in Costa Rica's Monteverde Cloud Forest Reserve.

Key words: human use zoning, Monteverde Cloud Forest, Costa Rica, limits of acceptable change, management plan, Open Standards, ecological integrity

INTRODUCTION

Protected areas have long stood as a cornerstone strategy to protect biodiversity, but strict preservation rarely serves as an area's sole objective because protected areas must provide multiple values for multiple users in society. One tool often employed to manage these value demands is zoning. Managers have deployed zoning in recent decades to allocate different uses to different spaces within protected area boundaries. The assumption is that by zoning off human activities incompatible with natural resource conservation from areas of greatest natural value, managers better protect natural resources (Gilg, 1981).

Spatial zoning is not a new idea and did not originate in natural areas; the concept can be traced back to Germany in the 1800s (Hirt, 2007). German urban planners created zones to separate incompatible uses. They also included mixed-use zoning where some uses could coexist in the same space. American cities later imported this model, but did not adopt mixed-use zoning at first, which generated numerous urban problems well documented in the literature (Logan, 1976; Wickersham, 2000). This model of 'human use zoning' (HUZ), that later migrated to terrestrial wildlands (Shafer, 1999) and then marine protected areas, also generated theoretical and practical challenges (Russell, 1994) such as conflicts among different users competing for the same spaces (e.g., tourists and conservationists).

Though the HUZ model is widely cited in important protected area texts about management planning (Young & Young, 1993; Miller, 1978; Clark, 1979; Thomas & Middleton, 2003; Manning, 2011; McCool et al., 2007; Leung et al., 2018) and employed by all the countries' general management planning guidelines cited hereafter, managers face difficulty translating zones from paper to reality for several reasons. Often zones are defined for large swathes of terrestrial and

marine areas, and thus lack sufficient detail to address local realities. Other times political realities change, say a new claim on land tenancy, in ways that the zoning system cannot respond. Consequently, managers may feel obligated to ignore assigned zones or rezone conflict areas into a less-restrictive category or exclude them from the zoned area altogether.

This paper presents a zoning approach to overcome conceptual HUZ problems and be more suited to implementation, especially for developing country park systems such as that of Costa Rica. It also demonstrates that a condition-based zoning (CBZ) approach is compatible with conservation planning approaches, such as the Open Standards for the Practice of Conservation (Conservation Measures Partnership, 2020), a methodological framework for the adaptive management design and monitoring of conservation projects and already required in many Latin American countries' management planning guidelines. Our objectives then are that CBZ should a) better focus resources and attention on priority conservation threats, b) prove relatively easy to implement, c) require fewer resources and a light learning curve to apply, and d) integrate into conservation planning processes often adopted in developing countries. Thus, CBZ should contribute to on-the-ground conservation decision-making, resolve some stakeholder conflicts about disputed resources, and prove sufficiently adaptable in a rapidly changing world.

PROBLEMS OF HUMAN USE ZONING

The main concept of HUZ — one principal land or economic use per zone — was initially developed in German cities to separate incompatible uses such as slaughterhouses and glue factories from residences, but also included mixed-use zoning to accommodate compatible uses (Hirt, 2007). American cities adopted HUZ during the industrial revolution (Logan, 1976), but did not adopt mixed-use zoning at first. Rather planners segregated all principal uses (residential, commercial, industrial and green space), compatible or not (Gerckens, 1994). This separation provoked numerous management problems (Logan, 1976; Walther, 1986; Wickersham, 2000):

- Separation greatly expanded infrastructure requirements such as transportation, sewer, water and electricity networks wasting resources across zones;
- Separation segregated economic classes and broke down communities unleashing suburban growth;
- Separation provoked competition among users for some spaces and left others unoccupied; and
- Zoning is subject to many exceptions, variances, amendments, favouritism and rezoning, motivated often by political rather than community benefits (Kramer, 1982; Russell, 1994).

Consequently, urban planners proposed alternative zoning to overcome these weaknesses, such as performance-based (Russell, 1994) and form-based code (Talen, 2009; Madden & Russell, 2010). The former model focuses on regulating impacts rather than uses, similar to managing for impacts on biological resource conditions. The second regulates building form and location, and is also condition-based. Both allow a mix of different uses as long as they uphold the established conditions (Thede et al., 2014). Planners use both approaches today.

Transition OF HUZ to Wildlands

Discussion of urban zoning is relevant because it was eventually applied to rural land use planning in the 1920s (Rowlands, 1933), protected area buffer zones in the 1930s (Shafer, 1999) and then to protected areas globally. UNESCO, for example, adopted such zoning for biosphere reserves (McNeely, 1990), while seminal texts in park literature (cited in the introduction) advocate HUZ largely based on the benefit of resolving use conflicts and breaking down larger protected areas into more manageable zones with specific management objectives. As with cities, HUZ caused problems in wildlands too:

- Protected areas are zoned according to human uses rather than the conservation objectives for which protected areas are created (Lindberg et al., 1997);
- Knowing the use does not indicate the resource condition desired in zoned areas;
- HUZ assumes the incompatibility of different uses pitting one use against another, often unnecessarily, reducing overall the kinds of users in a protected area. Some uses are compatible such as research and ecotourism. In some cases, a minor compromise of one conflicting goal could satisfy both goals (Cole & McCool, 1997);
- HUZ reduces different manifestations of use categories to just one scale of impact (industrial and small-scale agriculture to 'agriculture' or strip-clearcutting experiments and bird banding to 'research');
- HUZ, such as absolute conservation or core zones, gives the illusion of exclusion when in fact multiple uses take place together. For example, the most protected zones are often the most desirable for tourism;

- As with carrying capacity, managers often regard prohibition as the central enforcement tool associated with zoning. This can cause controversy due to equity issues about who can enter and how, and who cannot (Kohl & McCool, 2016); and
- HUZ in urban and wild settings is insensitive to different uses which in urban contexts motivates planners to create variances, amendments and other exceptions, while in protected areas, it can either promote lax enforcement or rezoning to accommodate different stakeholder needs.

In addition to these conceptual challenges, there is often little evaluation of zone effectiveness. Lourival et al. (2011) argue that for biosphere reserves land uses are often assigned ad hoc to zones not designed to be quantitatively measured for success. This lack of a quantitative monitoring plan for zones may be more widespread than just biosphere reserves. Similarly, Simons-Legaard et al. (2018) indicate that since habitat monitoring is rare, zones designed to protect species and habitat likewise cannot be evaluated. Thede et al. (2014) in their evaluation of Canadian national park zoning refer to zone evaluation in general,

> ...it remains questionable if such a monitoring framework for standards and indicators on the scale of a national park, given the sometimes simplistic nature of some zoning systems, could actually achieve its goals. It is probably for that reason that not many evaluations of a zoning system in protected areas have ever been undertaken (p. 639).

Two motmots hang out on a clear day in a cloud forest © Jon Kohl

While a few cases of zone monitoring exist in the literature, for example, New South Wales Marine Parks Authority (2009), Emslie et al. (2015) and Strand et al. (2019), it would appear that the lack of zone evaluation may be due to the larger lack of quantitative monitoring plans for protected areas, a deficiency that the condition -based zoning model precisely aims to improve.

Zoning Proposals to Overcome HUZ Weaknesses

Proposals for alternative protected area zoning have proliferated, such as risk-control zones (Zeng et al., 2012), zoning designed to reduce conflicts (Davos et al., 2007; Lin & Li, 2016; Pristupa et al., 2018), the habitat suitability approach for pandas (Liu & Li, 2008), highly technical condition-based zoning for cumulative impacts vs. activity impacts in isolation (Halpern et al., 2008), and others. Despite these, few have been assessed for effectiveness or even whether park systems have adopted them. Only one paper among the nearly 120 reviewed here indicated explicitly that their model was not adopted (Ruiz-Labourdette et al., 2010). This is especially problematic when many developing countries still do not even use zoning (del Carmen Sabatini et al., 2007). Important reasons for not adopting or using zones include:

- *Inappropriate technology* For example, many decision-support tools need significant investment so that under-resourced park systems can incorporate them into management structures such as Marxan with Zones management software (Watts et al., 2009; Jumin et al., 2018). There is significant literature on the barriers to transferring decision support tools to real-life contexts (Mora et al., 2012; Street et al., 2018). Many proposals are also highly technical, mathematical and data intensive especially for developing country systems. Boon et al. (2014) admit that their own proposal may in fact be too data intensive for Cambodia where they applied their model.
- *Too little real participation* Naughton (2007) notes that many zoning proposals claim to be participatory but are really top-down. Consequently, without authentic public support many policies never reach implementation.
- *Inability to incorporate subjective and conflicting values* Academics often promote zoning as objective, technical exercises, much like carrying capacity, which leave little room for subjective decision-making and conflict resolution. As mentioned, proposals have emerged to manage conflicts, and few have explicitly tried to incorporate visitor perception and other subjective values. Only two proposals, for example, include part of the Limits of Acceptable

Change (LAC) approach (Roman et al., 2007; Bentz et al., 2016). Thus, when conflicts emerge that zoning cannot resolve, managers either rezone, implement exceptions or override their zoning system altogether.

- *Lack of information* In many new protected areas, initial management plans are undertaken, at times because of donor insistence, when there is still inadequate baseline resource information. Sometimes, in the case of Monteverde, adequate baselines do not exist for priority conservation targets either.

OVERVIEW OF CONDITION-BASED ZONING

Resource conditions are a different criterion by which to define zones. This application shifts focus from human uses or activities to resource conservation. A CBZ system assumes that in general human uses are acceptable as long as they do not violate desired zone conditions. This releases a great burden on managers and policymakers who expend significant energy legislating uses when a focus on biodiversity and cultural resource conditions is more mission consistent. Resource conditions are already the basis for conservation planning such as the Open Standards as well as for protected area categories (IUCN, 2008).

CBZ-based approaches began with the Recreation Opportunity Spectrum (ROS) developed in the late 1970s (Clark and Stankey, 1979; Haas et al., 1987). This system divides a protected area into different zones along a spectrum of naturalness from highly developed service areas (such as a gateway community) to primitive areas. Each zone represents a different visitor recreation experience opportunity, and management configurations vary accordingly.

ROS inspired the model developed by Kohl, Sierra and Sevilla (2006) and a zoning manual written for the Costa Rican protected area agency, Sistema Nacional de Áreas de Conservación (SINAC) (2018) which emerged from a perceived need to develop a new approach in Costa Rica. The current CBZ proposal is based on these sources. Though SINAC has mandated an HUZ approach (SINAC, 2014), relying heavily on human activity regulation, at the same time its management planning guidelines call for zones to manage desired conditions with conservation targets and objectives, but does not indicate how to combine human activity zoning and conservation planning based on the Open Standards. Thus, this CBZ model aims to bridge the gap between SINAC's official mandate to use HUZ and to use resource conditions and conservation targets. See Table 1 for a comparison of CBZ and HUZ.

This CBZ model focuses on biophysical conditions (e.g., populations, canopy coverage, biodiversity, erosion, etc.) that correspond to conservation targets defined during conservation planning, using schemes such as the Open Standards adopted in the formal management planning guidelines by Brazil (de Faria Bacellar et al., 2018), Chile (CONAF, 2017), Colombia (Ospina Moreno et al., 2020), Costa Rica (SINAC, 2014), Ecuador (Columba Zárate, 2013), Guatemala (CONAP, 2012), Honduras (Corrales, 2014), Uruguay (Mejia, 2012) and

Table 1. Comparison of CBZ and HUZ, adapted from Sierra and Arguedas (2007)

HUZ Limitation	CBZ Alternative
Focuses on human uses rather than resource conditions; primary tool is use restriction.	Zones defined by desired conservation target conditions; restriction is one of many management options.
Standardised zones applied to complex and variable situations *in situ*.	Each zone is unique to its conservation target situation; no standardised zones necessary.
Non-overlapping exclusionary use zones can provoke conflicts between users in same spaces.	Uses and zones can overlap. Integration of LAC applies in spaces with use conflicts when certain requirements are met.
Must cover entire area.	Zones not required to cover entire area. Primary zones cover only conservation targets, while secondary zones may optionally be applied to other spaces as needed.
Monitoring resources divided between human uses and conditions.	Monitoring focused on resource conditions.
Often requires complex technical determinations or expensive decision support tools to define zones.	No need for additional decision support tools. Zone definitions are updated as new information emerges.
HUZ definition considered an objective, technical process that largely excludes significant community participation and does not build their support.	CBZ integrates both objective (quantitative indicators) and subjective (negotiated among stakeholders) criteria.
HUZ often becomes official regulation, hard to update.	Often CBZ does not use a legal framework, and its approach is based on LAC-adaptive management which requires continued experimentation and improvement, thus preventing zones from becoming legalised and immutable.
Once zones are legalised, staff focus on their administration without further learning.	By focusing on monitoring conditions and negotiating conflicting uses in an adaptive management process, learning and improvement are built into the system.

others. These targets represent formal conservation objectives in management plans (Parrish et al., 2003), including for this pilot application in Monteverde Cloud Forest Biological Reserve.

The proposal also uses a methodology with appropriate technology that is easily learned and applied by local staff. It depends on local participatory decision-making, rather than on technical experts who merely consult stakeholders and then make decisions themselves. Last, it integrates LAC to give voice and process to conflicting values that require negotiation to define zones acceptable to various interests.

The CBZ Model

This model defines zones based on conservation targets, and thus is appropriate for any protected area or category that uses such targets. Each target receives one unique zone. The model does not use standardised zone categories commonly applied in protected areas, such as in biosphere reserves (core, buffer, transition). Managers tailor each zone's objectives, standards, indicators, etc. to the specific conservation target defined previously in the planning process. Without explicitly defined conservation targets, this approach may not work. Participants then map zones based on habitat/landscape features that bound the target. Zones may overlap and extend beyond area boundaries across the landscape as buffer zones (see protected landscape approach in Brown et al., 2005). Significant gaps may result between zone distributions. Managers may define these gaps as secondary zones, or whatever zone name they desire, based on other desired conditions, political, regulatory or managerial criteria (service area, villages, private inholding, etc.) or may leave them unzoned for future definition, though of course management still exists there.

As described below, where conflicts might exist between stakeholder values, managers can apply LAC to negotiate a consensus limit of acceptable change rather than an ideal conservation objective based on best available science. Where no conflict exists, managers formulate objectives based on best available science. LAC works on the premise that when two management objectives conflict (e.g., conservation and human settlement), if stakeholders can agree to prioritise one, then they can modify the second so that both become compatible. This process integrates subjective stakeholder values and requires a willingness to negotiate and the possibility of modifying management objectives. It is not always possible to negotiate, for example, with a critically endangered species conservation objective.

In addition to its negotiation function, LAC also involves seven to ten (depending on the version) overarching process steps that make it an adaptive management process or cycle (McCool, 2013). The CBZ model uses these steps to define the process to develop condition-based zones, since zone development and management should also be adaptive, as seen in Table 2.

Given that CBZ is not a prescriptive or regulatory tool, rather one that focuses attention on conservation targets, a protected area still needs to control and enforce human activities. The methodology assumes that protected areas will still have regulations in addition to the management actions defined for primary or condition-based zones. They would still apply across zones as necessary, focused on human activities that do not relate to target conditions. See Kohl and Herrera-Fernández (2021) for how human uses can be modified to be more consistent with conservation target conditions.

Table 2. Comparison of Standard LAC and CBZ Model Process Steps. Source: Stankey (1985) modified by Cole and McCool (1997)

Step	LAC	CBZ Process Based on LAC
1	Define goals and desired conditions	Assemble and train planning team
2	Identify issues, concerns and threats	Determine conservation targets, objectives, threats and conditions
3	Define and describe prescriptive management zones	Draw and name zones around conservation targets
4	Select indicators	Identify conflicts and decide whether to use ideal objectives or limits of acceptable change
5	Specify standards	Define objectives or limits of acceptable change and indicators
6	Identify management actions	Define standards
7	Implement actions	Determine preventive and corrective management actions
8	Monitor	Implement actions and monitor

APPLICATION OF CBZ IN MONTEVERDE

Site Description

The Monteverde Cloud Forest Reserve is managed by the Tropical Science Centre (TSC), a Costa Rican non-profit whose mission is "to be the scientific organization of excellence in innovative solutions for conservation and sustainable development". Consistent with that mission, TSC's four protected areas stopped using SINAC's formal management planning guide some years ago (personal communication, Carlos Hernandez, 2019) in favour of what it considers more innovative management approaches. Monteverde, therefore, along with the PUP Global Heritage Consortium, a US-based natural and cultural heritage management non-profit, sponsored the CBZ model testing as part of its management planning process.

The reserve covers 4,125 ha and hosts conservation priority bird species such as the Resplendent Quetzal (*Pharomachrus mocinno*) and Three-Wattled Bellbird (*Procnias tricarunculatus*) and amphibians such as the Ring-tailed Salamander (*Bolitoglossa robusta*) and the Highland Dink Frog (*Diasporus hylaeformis*). Cloud forest covers much of its surface.

Figure 1 shows that Monteverde's 2005 zoning map consisted of four use-based zones: Absolute protection (core), public use, special use and social interaction (buffer zone inside the adjacent biological corridor).

Reserve staff indicated that their area was unique in that it did not have significant threats to its conservation targets or inappropriate uses within its boundaries. It did indicate that climate change would almost certainly produce serious challenges through drought, changing food sources, cloud cover reduction and invasive species, all of which have already begun.

Given that in 2019–2020, Monteverde updated its 2005 management plan, it agreed to implement the CBZ model as part of that process both to teach staff new conservation approaches and innovate a more useful zoning model.

Pilot Application

The authors crafted these steps into a methodological manual (Kohl & Herrera-Fernández, 2021) based on various references (SINAC, 2014, 2018; PUP Global Heritage Consortium, 2015; Conservation Measures

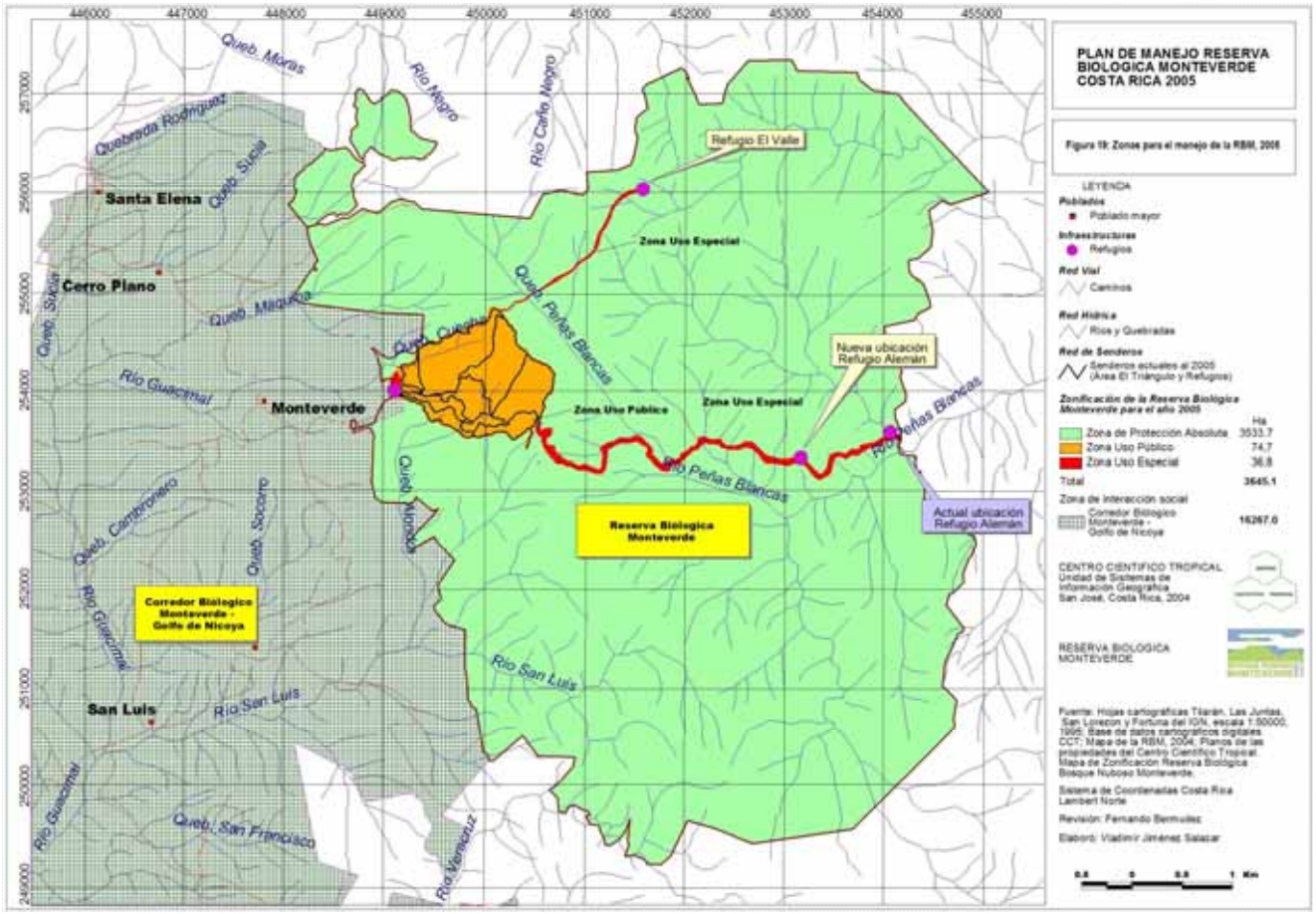


Figure 1. In 2005 Monteverde had four use zones: absolute protection, public use, special use and social interaction

Partnership, 2020). While managers can apply the theoretical steps across a wide range of methodologies, Monteverde elected to apply them during a two-day workshop. See Table 3 for a workshop overview.

The staff were shown a training video prepared by the authors and attended a Q&A session with them as well. The reserve director assumed the responsibility for studying the manual, preparing the team and facilitating the workshop. The first author (Kohl) participated in the workshop to offer a morning reinforcement training, answer questions about the methodology and its application, and document its execution, not facilitate it. He noted how well the team used the methodology and identified challenges and improvements. After the application, the authors evaluated the process against the above-mentioned objectives.

Monteverde Cloud Forest Reserve is already registering lower cloud levels likely due to climate change © Jon Kohl

RESULTS AND DISCUSSION

Given that this paper proposes a methodology whose effectiveness will not be known for some time, this section provides evidence of the methodology's implementation in Monteverde, overcoming difficulties identified in the literature on zoning implementation noted above in "Zoning Proposals to Overcome HUZ Weaknesses".

Evaluating the approach's fulfilment of its objectives

The authors proposed four objectives.

a) CBZ should better focus resources and attention on priority conservation threats.

For Monteverde, this focus shift from uses to conditions resulted in a clearer understanding of its conservation targets, the research necessary to manage those targets, and the resource reallocation to carry out that research. For example, during the workshop, staff realised that they had to increase the number of transects to measure target amphibian and reptile occurrence and run those transects during dry as well as wet seasons. They discussed how to reallocate volunteers and rangers to meet the increased needs and what the trade-offs would be. Though they began with a HUZ focus, they discovered that directly focusing on conservation not only revealed research and resource gaps, but allowed them more flexibility (rather than focusing on how to restrict human activities which requires significant energy) in conserving high-priority targets.

b) CBZ should prove relatively easy to implement.

The approach did require a new zoning model and a refresher of indicators, standards, objectives and conditions. From the outset, the director was asked to apply the training materials to lead his team through the consensus-based steps with only moderate support from authors. He did that, and the team produced a hand-drawn zoning map later digitalised (Figure 2) with precise coordinates and zone management table

Table 3. Workshop Overview

Focus Question	How do we create a zoning methodology that, with brief training, can be implemented by staff of the Monteverde Cloud Forest Reserve during a two-day workshop?
Agenda	Day 1: Training (morning); defining zones (morning–afternoon) Day 2: Indicators and standards (morning); management actions (afternoon); process evaluation (afternoon–evening)
Deliverables	• Pre-workshop baseline document describing conservation targets, threats, objectives, existing conditions and current zoning • CBZ map, hand-drawn and later digitalised • Zone narratives including conservation targets, conditions, threats, indicators, standards, management actions (preventative and corrective), cost and feasibility strategies, strategy prioritisation • Workshop proceedings including process evaluation • Draft methodological manual (updated based on the workshop, Kohl & Herrera-Fernández, 2021)

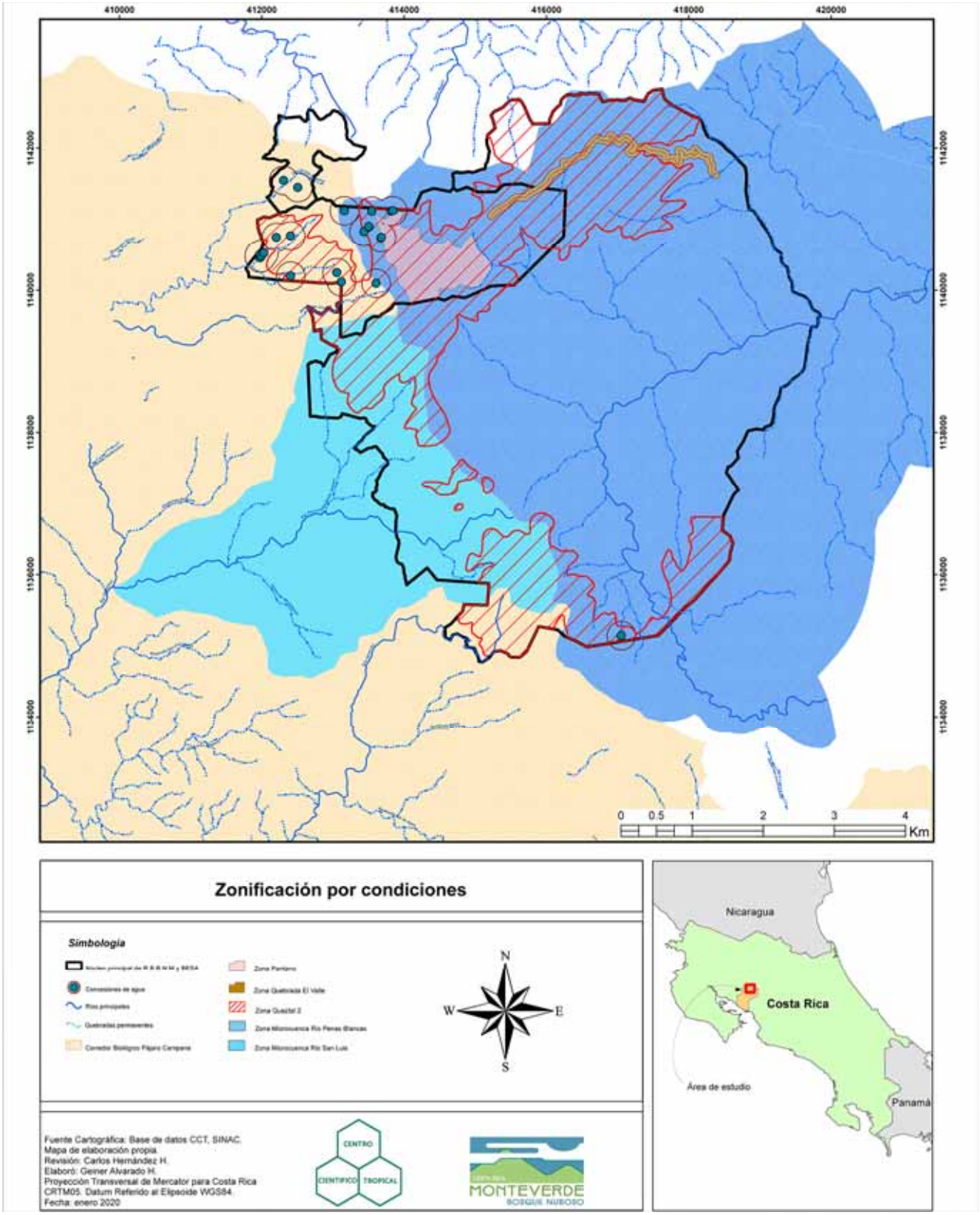
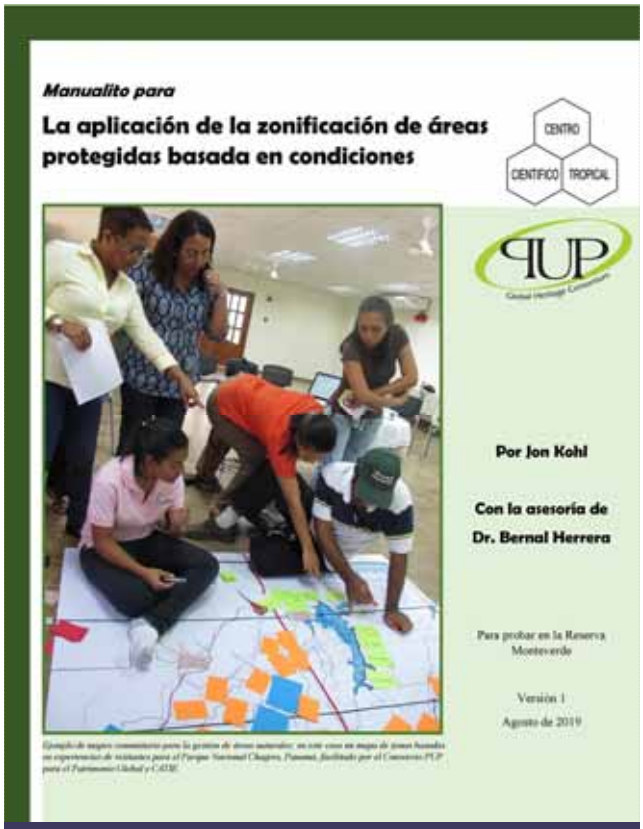


Figure 2. The condition-based zone map uses six zones within the reserve and one outside, the biological corridor for the Three-Wattled Bellbird. Staff digitalised this map from the hand-drawn version

(Supplementary Material) which will have undergone modification during the following planning steps. The director (who coordinates all TSC's protected areas) indicated that his organisation intended to adopt and include this zoning in its management plan. He even budgeted (just prior to the onset of the Coronavirus pandemic) for training workshops for nearby national parks to further develop this approach and integrate their zoning systems with that of Monteverde. In short, with moderate assistance from us, the team applied the methodology without investing in new technical methods or tools and generated favourable results.

The CBZ model uses LAC's overall process steps as well as its framework for negotiating conflicting subjective values among management objectives. Given Monteverde's low stakeholder conflict, we did not apply this tool in this specific test case.

c) Applying CBZ should require fewer resources and a light learning curve.
In terms of appropriate technology, the CBZ model does not require new software or technical skills. Indeed, TSC invested no additional resources except the time required to develop training materials and Kohl's workshop accompaniment. All materials were immediately on hand. Though the team did require a refresher on indicators and standards, the director largely guided the team through the process.



Manual cover

d) CBZ should integrate into the conservation planning often adopted in developing countries.
Given that Monteverde's planning process had already defined six conservation targets, the CBZ model built on what they had done and produced zones more focused on research and condition management than human use restriction and enforcement. Since SINAC's official management planning manual requires the Open Standards, the team demonstrated a practical way to apply them to zoning. We note that because Monteverde is a private reserve, its staff enjoy more latitude to experiment than staff of national protected areas. Despite this, its technical team was not necessarily better trained or larger than that of other similarly sized parks in Costa Rica.

Lessons Learned

The team debriefed and generated four principal lessons learned from this experience.

α. Conservation targets had not been sufficiently detailed to create a monitoring and management framework, and thus the team had to break targets down into more specific components to specify conditions, indicators, standards and management actions. Nevertheless, this breakdown was an important contribution to the management planning process and one they might have skipped if not obligated by this methodology to generate those components.

β. By focusing on conservation targets rather than visitors, it became apparent that despite many years of research there were still big research gaps to establishing specific and measurable conservation objectives for their targets. The process further helped to elucidate where the reserve had to redistribute resources to carry out effective conservation activity.

χ. During application, the team discovered that Monteverde did not register significant threats or stakeholder conflicts. They considered that this may have been due in part to its history dating back to Quaker community roots and its quick ascent to fame as an isolated yet renowned ecotourism destination. At the same time, this trait made it impossible to test the LAC negotiation component even though the team applied the rest of the methodology.

δ. CBZ fitted into their management planning process and the only disruption might have been to revisit

Zoning workshop, Monteverde Cloud Forest Reserve © Jon Kohl

conservation targets previously identified to make them more operational. The lesson then is that zoning should always integrate into a larger planning process as it cannot alone achieve conservation.

CONCLUSIONS

Generalisability

The HUZ model is so dominant internationally that, one might infer, it did not even merit a single section in IUCN's (Worboys et al., 2015) one-thousand-page tome about protected area management and governance. Similarly, UNESCO's principal resource manual for protected area management, Managing Natural World Heritage, dedicates a single paragraph to human use zoning (UNESCO, ICCROM, ICOMOS, IUCN, 2012). Likewise, the HUZ approach dominates Latin America and most less developed countries. Certainly, this CBZ model could work anywhere, but would work best in systems that already use conservation planning approaches with conservation targets; in such cases, the CBZ builds on what already exists. In Latin America, at least Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Honduras and Uruguay formally require conservation planning such as the Open Standards in their management planning guidelines. If the abundance of condition-based zoning approaches in the literature is any measure, the protected area management field has perceived HUZ weaknesses and thus the CBZ model contributes to a trend toward condition-based zoning.

While TSC does have a qualified team and a venerable science-based innovative non-profit to support it, their reality is not that different from technical teams throughout Latin America. With little extra training and no new technical tools needed, that the Monteverde team implemented the methodology in large measure on its first try bodes well for other technical teams across Latin America and developing countries generally with small budgets, let alone better resourced protected area systems.

Certainly, Monteverde's lesson that the CBZ model allowed its staff to focus more clearly on the nature of their conservation targets, research gaps and specific strategies may very well benefit any site that uses HUZ and which may not be investing in their conservation targets as efficiently as they might otherwise do with a condition-based focus.

Further Research

Despite the director's intent to integrate CBZ into management planning, until it can be shown that Monteverde has reallocated research resources to conservation targets, improved indicators, standards and actions, it is unclear if this approach has more likelihood of moving from park paper to park implementation than any other zoning proposal in the literature. Since this project focused exclusively on methodology, it never set out to test longer-term outcomes. For this reason, further research would be necessary to indicate how such integration proceeds and what are its associated costs and impacts.

Furthermore, the methodology needs to be applied in protected areas without the same level of resourcing and international acclaim, and with a more typical assortment of conservation threats and conflicts. It is unclear to what degree Monteverde's conditions diverge from those of surrounding national parks.

Finally, as Kohl and McCool (2016) argue, tools and approaches that require adaptive approaches, and that include subjective criteria, are ones that require a learning culture to implement (as noted in the final step of the Open Standards). It is not enough simply to train a team in the steps and tools if their organisation is not set up to encourage organisational learning, experimentation, embracing errors as learning opportunities, lower risk aversion and a stable work environment (Argyris & Schön, 1996). It may be that TSC's culture, given its emphasis on learning and innovation, makes it a more likely candidate to adopt such an approach than a more bureaucratic public institution. Such institutions are characterised by people being frequently reassigned among protected areas, with limited job security and merit-based promotions, and few resources for training and learning together, which usually results in lower implementation (Thede et al., 2014).

SUPPLEMENTARY ONLINE MATERIAL

Description of the major LAC-based steps in the CBZ Model

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RESUMEN

La zonificación de áreas protegidas para uso humano asigna diferentes usos de los recursos terrestres y marinos a distintas zonas de gestión, en teoría, para evitar o restringir actividades incompatibles con los objetivos de gestión. Sin embargo, a pesar de su popularidad mundial, la zonificación basada en el uso humano suscita problemas como la separación de usos compatibles y el consiguiente conflicto entre usuarios (por ejemplo, investigadores y ecoturistas). Asigna más recursos a la gestión de los usos humanos que a las condiciones biofísicas que las áreas protegidas deben conservar. Reduce las manifestaciones de un mismo uso (por ejemplo, la agricultura intensiva y la de pequeña escala) a una sola escala de impacto. Utiliza criterios objetivos para definir las zonas en situaciones en las que los valores subjetivos pueden entrar en conflicto. En respuesta, han surgido sistemas de zonificación alternativos, entre ellos, los enfoques basados en las condiciones de los recursos. Sin embargo, estos tienden a ser muy técnicos, a ser mal evaluados y a mostrar pocos indicios de adopción por parte de los sistemas de áreas protegidas, especialmente en los países en desarrollo. De ahí que el presente artículo propone un enfoque basado en las condiciones que aborda estos puntos débiles mediante la utilización de objetivos de conservación predefinidos como criterio principal para definir las zonas, vinculando así claramente la planificación de la conservación (como los Estándares Abiertos para la Práctica de la Conservación) y la zonificación de la gestión. La zonificación basada en las condiciones se centra en acciones estratégicas de conservación con el uso de condiciones, indicadores, estándares y las correspondientes acciones de gestión preventiva y correctiva, en lugar de ser prescriptiva y punitiva como ocurre con el modelo de zonificación basada en el uso humano. El artículo propone, además, una tecnología y una metodología más adecuadas a la capacidad técnica de los países en desarrollo. También establece el desarrollo de la zonificación basada en las condiciones desde el principio de la zonificación urbana y presenta una aplicación piloto en la Reserva Biológica Bosque Nuboso Monteverde, en Costa Rica.

RÉSUMÉ

Le zonage des aires protégées à usage humain attribue différentes utilisations des ressources terrestres et marines à différentes zones de gestion pour, en théorie, éviter ou réduire les activités incompatibles avec les objectifs de gestion. Cependant, malgré sa popularité mondiale, le zonage à usage humain génère des problèmes, tels que la séparation des utilisations compatibles et ainsi les conflits d'utilisateurs qui en découlent (par exemple, entre chercheurs et écotouristes). Il alloue plus de ressources à la gestion des usages humains qu'aux conditions biophysiques que les aires protégées sont chargées de conserver. Il réduit les manifestations d'une même utilisation (par exemple, l'agriculture intensive et à petite échelle) à une seule échelle d'impact. Il utilise des critères objectifs pour définir des zones dans des situations où les valeurs subjectives peuvent entrer en conflit. En réponse, des schémas de zonage alternatifs ont émergé, parmi lesquels des approches fondées sur les ressources. Celles-ci, cependant, ont tendance à être très techniques, mal évaluées et montrent peu de preuves d'adoption par les aires protégées, en particulier dans les pays en développement. Le présent document propose donc une approche fondée sur les conditions qui répondent à ces faiblesses en utilisant des cibles de conservation prédéfinies comme principaux critères pour définir les zones, établissant ainsi un lien clair entre la planification de la conservation (tels les Standards ouverts pour la pratique de la conservation) et le zonage de gestion. Le zonage conditionné met l'accent sur les mesures stratégiques de conservation ayant recours aux conditions, aux indicateurs, aux normes et aux mesures de gestion préventives et correctives correspondantes, plutôt que d'être prescriptif et punitif comme c'est le cas pour le modèle de zonage à usage humain. En outre, l'article propose une technologie et une méthodologie plus adaptées aux capacités techniques des pays en développement. Nous retraçons également le développement du zonage conditionnel à partir des premiers zonages urbains et présentons une application pilote dans la réserve de forêt nuageuse de Monteverde au Costa Rica.

ASSESSING THE EXTENT AND CONTRIBUTION OF OECMS IN SOUTH AFRICA

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ABSTRACT

In 2018, Parties to the Convention on Biological Diversity (CBD) adopted a definition and criteria for identifying other effective area-based conservation measures (OECMs). South Africa is one of the first countries to undertake a comprehensive national review of its potential OECMs. Previous research results already estimated that 48.5 per cent of sites within South Africa's unprotected Key Biodiversity Areas could potentially meet the OECM definition. A subsequent multi-stakeholder study provided an opportunity to assess the alignment between OECMs and national conservation policy and practice, to further determine the potential extent of OECMs, and whether OECMs may strengthen the country's collective conservation estate. This study led to several findings. First, the OECM framework facilitates the formalisation, expansion and reporting of South Africa's conservation areas estate. Second, OECMs strengthen interconnected landscapes and seascapes alongside protected areas. Third, OECMs can include a diverse range of rights-holders contributing to area-based conservation, including previously marginalised groups, land use types and sectors. Fourth, OECMs play a role in supporting local economies that are simultaneously safeguarding environmental assets. A significant challenge remains to leverage financial and human resources to assess, report, monitor and support OECMs, without diverting resources from other conservation priorities, especially protected areas.

Key words: Convention on Biological Diversity, area-based conservation, conservation estate, sustainable landscape

INTRODUCTION

In 2010, Parties to the Convention on Biological Diversity (CBD) agreed on the Strategic Plan for Biodiversity (2011–2020). In this Plan, Aichi Target 11 calls on Parties to conserve 17 per cent of terrestrial and freshwater areas and 10 per cent of marine and coastal areas through well-connected systems of protected areas and other effective area-based conservation measures (OECMs). Parties to the CBD subsequently defined 'other effective area-based conservation measure' as:

> A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in-situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values. (CBD, 2018)

In light of the advent of the definition and criteria for identifying OECMs (CBD, 2018) and IUCN guidelines for Recognising and Reporting OECMs (IUCN-WCPA, 2019), there is a need to assess the potential extent of OECMs and whether the OECM designation strengthens the national conservation estate in South Africa.

In a previous study that assessed the prevalence of potential OECMs in 740 terrestrial Key Biodiversity Areas (KBAs)[1] outside known or mapped protected areas across ten countries, indications were that the majority of unprotected KBAs (76.5 per cent) were at least partly covered by one or more potential OECMs (Donald et al., 2019). These and other (Dudley et al., 2018) results provide strong evidence that OECMs could complement protected areas to fulfil their original intent in Aichi

Target 11. An estimated 48.5 per cent of sites in South Africa's unprotected KBAs had underlying governance and management characteristics that potentially met the OECM definition (Donald et al., 2019). Based on these findings, South Africa undertook a comprehensive national review of potential OECMs (Marnewick et al., 2020). This paper provides an overview of the extent, opportunities and challenges in the South African context.

SOUTH AFRICAN CONTEXT: BIODIVERSITY STEWARDSHIP

South Africa is a world leader in systematic biodiversity planning, biodiversity reporting, protected area legislation and protected area expansion, particularly on non-state land (SANBI, 2018; Stevens, 2019; Wright et al., 2018). South Africa defines a protected area as a geographically defined area of land or sea that is formally protected in terms of the National Environmental Management: Protected Areas Act No. 57 of 2003 (The Protected Areas Act) (DEA, 2003) and managed mainly for biodiversity conservation. In addition to protected areas, South Africa also recognises 'conservation areas'. South Africa defines its conservation areas as areas of land or sea that are not formally protected in terms of The Protected Areas Act but are nevertheless managed at least partly for biodiversity conservation (SANBI, 2016). Conservation areas contribute towards the country's broader conservation estate but not the protected area estate (SANBI, 2016). South Africa's conservation estate is an inclusive term referring to all protected areas and conservation areas (SANBI, 2016). South Africa's policy and legislative framework illustrates the distinction between protected areas and conservation areas. Protected areas and conservation areas in South Africa are recognised and reported on separately. Biodiversity stewardship is South Africa's primary tool for expanding the country's conservation estate. Biodiversity stewardship is a state-led initiative that involves securing land in biodiversity priority areas through voluntary agreements with private landowners, Communal Property Associations and the occupiers of communal land. Biodiversity stewardship is led by conservation authorities and supported by conservation NGOs (SANBI, 2018).

The biodiversity stewardship framework consists of a hierarchy of agreements under three categories: 1. Protected Areas (as defined above), 2. Conservation Areas (as defined above), and 3. Biodiversity Partnership Areas (SANBI, 2018, see Table 1). Category 1 includes state-owned protected areas and 'contract'[2] protected areas (SANBI, 2016). Between 2008 and

Candidate OECM - Research facility nestled within the surrounding bushveld © ReWild Africa

Table 1. Biodiversity stewardship categories (SANBI, 2018)

Increasing biodiversity importance

Increasing support from conservation authority

Increasing commitment to conservation

TYPE OF AGREEMENT	LEGAL MECHANISM	DESCRIPTION
BIODIVERSITY STEWARDSHIP CATEGORY 1: PROTECTED AREAS		
Nature Reserve or National Park	National Environmental Management: Protected Areas Act (Act 57 of 2003)	• Suitable for sites with highest biodiversity importance • Binding on property: declaration of Nature Reserve, and a title deed restriction • Binding on landowner: contract with landowner usually for 99 years/in perpetuity** • Considered to be part of South Africa's protected area estate, and contributes to meeting protected area targets
Protected Environment	National Environmental Management: Protected Areas Act (Act 57 of 2003)	• Suitable for declaration over multiple properties • Less restrictive land use than Nature Reserve or National Park • Binding on property: declaration of Protected Environment Optional title deed restriction. • Binding on landowner • Considered to be part of South Africa's protected area estate, and contributes to meeting protected area targets
BIODIVERSITY STEWARDSHIP CATEGORY 2: CONSERVATION AREAS		
Biodiversity Management Agreement	National Environmental Management: Biodiversity Act (Act 10 of 2004)	• Less restrictive than protected area declaration • Must have a Biodiversity Management Plan (in terms of Biodiversity Act) on all/part of the property • Binding on landowner: contract with landowner for a minimum of 5 years, or longer in 5 year increments
Biodiversity Agreement	Contract law	• Less restrictive than protected area declaration • Binding on landowner: contract with landowner for a minimum of 5 years or longer
Conservation Servitude	Property	• Less restrictive than protected area declaration • Binding on landowner: notarial deed registered at the Deeds Registry for a minimum of 99 years or in perpetuity • Binding on successor in title • Provides management
Business, Industry and Biodiversity initiatives		Examples: • Conservation Champions Programme • Water Stewards • Sustainable Farming
Conservation agreements		• Offers direct incentives for conservation through a negotiated benefit package in return for • conservation actions by communities. • Signed for a 3-year duration (with the option for renewal)
BIODIVERSITY STEWARDSHIP CATEGORY 3: PARTNERSHIP AREAS		
This is an informal category of biodiversity stewardship which involves a registration of a site within this category by the provincial conservation authority or conservation NGO. • No legal certainty, duration and intent • Involves collective action by landowners or communities • Biodiversity conservation management benefits without formal agreements or accountability • Registration of mechanisms is advised		Examples of such include (but are not limited to): • Conservancies • Buffer Zones and Transition Zones of Biosphere Reserves • Sites of Conservation Significance • Community conservation areas
** Eligibility for tax incentives requires a minimum of a 99 year or in perpetuity title deed restrictions		

2016, 68 per cent (564,000 hectares) of all 'contracted' protected area expansion was achieved through biodiversity stewardship agreements (SANBI, 2018).

Category 2 provides for conservation areas described in the National Biodiversity Strategy and Action Plan as contributing to the broader conservation estate (DEA, 2015). South Africa has a government held database, the Protected Areas Conservation Areas (PACA) database, which records all protected and conserved areas in the country. As a result of this country specific context, South Africa historically reported both its protected areas as well as its conservation areas separately to the World Database on Protected Areas (UNEP-WDPA) and did so even before Parties to the CBD agreed on the definition of an OECM (CBD, 2018) and before the new UNEP database on OECMs was created. As a result of the acceptance of the OECM definition, South Africa can now formally assess its category 2 conservation area sites as OECMs. The assessments will allow for South Africa to report those conservation areas that meet the criteria to the new World Database on OECMs.

The biodiversity stewardship approach to land conservation is an efficient area-based conservation tool which is also cost-effective (SANBI, 2017), resulting in both protected and conserved areas. It offers a clear example of the interplay between privately protected areas and OECMs (Mitchell et al., 2018) and a clear framework within which South Africa's OECM national review took place.

METHODS

A country level assessment for South Africa was undertaken through a government and private partnership to determine the types and potential extent of OECMs in South Africa (Marnewick et al., 2020). The study broadly aimed to, 1) assist South Africa to institutionalise OECMs into its existing policy frameworks, and 2) align OECMs with the biodiversity stewardship community of practice, facilitating the full integration of all possible initiatives across South Africa that meet the OECM definition into biodiversity stewardship (Figure 1). The results provide empirical evidence and a detailed technical analysis of the prevalence and characteristics of effective conservation occurring outside of the South African protected area network. The country study results also informed the ongoing development of the IUCN's Site-level methodology for identifying other effective area-based conservation measures (IUCN-WCPA, Forthcoming).

To test the CBD definition and IUCN guidelines within a national context, the study aimed to achieve seven key objectives (Marnewick et al., 2020) which were implemented in three phases, of which key elements are presented below.

Phase 1 of the study included undertaking a national technical review pertaining to South Africa's legislative and policy frameworks and their interplay with the OECM definition. This review included identifying all potential OECMs and developing the first draft list of potential OECMs. This initial list included all known conservation areas under biodiversity stewardship categories 2 and 3, sites assessed in the study of Donald et al. (2019), and additional types of conservation areas considered to have OECM type characteristics.

Phase 2 included stakeholder engagement in workshops, focus groups and one-on-one interviews with area-based conservation experts and practitioners. The study invited all relevant national stakeholders to three workshops. Forty-three (43) participants from the government, the private sector and civil society attended the first two stakeholder workshops. Nineteen (19) participants from the government, the private sector and civil society attended the third workshop which specifically engaged with stakeholders for the case study

Figure 1. Key objectives and outcomes for the furthering of OECM work in South Africa

sites. The study also presented OECMs at several strategic meetings, workshops and conferences, including to the Biodiversity Stewardship Technical Working Group. In the first two extensive stakeholder workshops, the technical review and list of potential OECMs was presented and refined (Supplementary Online Material Table S1).

The list of potential OECMs was critical because it facilitated the selection of case study sites and broadly allowed the community of practice to refine sites for future assessment. A potential OECM is a geographically defined space that has been identified as having OECM-like characteristics by applying the screening tool but where the governance authority has yet to consent to it becoming a 'candidate OECM' (IUCN-WCPA, 2019). A candidate OECM is a geographically defined space that has been identified as a 'potential OECM' and the governance authority has consented to it being assessed against the CBD criteria (IUCN-WCPA, 2019).

Phase 2 also yielded the selection of a case study area. Due to its status and diverse ownership, governance and land use types, the Kruger to Canyons Biosphere Region (K2CBR) was identified as a suitable region to conduct the case study site assessments on potential OECMs. Assessing potential OECMs in the mosaicked configuration of protected areas and conservation areas found in the K2CBR also tested the complementary value of OECMs in such a conservation landscape (Figures 2 and 3).

Phase 3 focused on assessing the nine case study sites in the K2CBR, representing six types of potential OECMs (Table 2). Upon consent from the respective governance authorities, each site was assessed on its own merits as a candidate OECM, using the site assessment tool designed for this purpose (see below). Sites were assessed by representative(s) from the project partners and representative(s) of the sites' governance and/or management authority. The results from the site assessments were presented and discussed at the third stakeholder workshop, which also included site representatives.

Throughout the above phases, the study aimed to integrate OECMs into the national context. A project

Table 2. Potential OECM site performance against the OECM characteristics, using the 3-grade rating scale

Site Typo					OECM Characteristics				
#	Candidate OECM Type	Governance Type	Governance Authority	Management Authority	Biodiversity Value	Geographically Define	Governance	Management	Effectiveness
1	Private Game Reserve	Privately Owned	Board of Trustees; Constitution	Pvt. Management Company. Home-owners association					
2	Private Game Reserve	Privately Owned	Family trust; Constitution	None					
3	Ecotourism Establishment	Private Company	Private company (Companies Act)	Company Directors					
4	Military land	State Owned	South African Defence Force	Air Force Base					
5	Sustainable Agriculture/ Forestry	State Owned	State Department (across three departments)	State owned company					
6	Academic Institution Land	University	University governance structures	University's natural sciences academic department; infrastructure by Services Department					
7	Conservation Agreement (with 3rd party)	Communally owned land	Community Development Forum; Traditional Authority	Traditional Authority; Farmer's Cooperative.					
8	Community Conservation Area	Communally owned land	Traditional Authority	Traditional Authority					
9	Community Conservation Area	Communally owned land	Traditional Authority	Traditional Authority					

steering committee was established for this purpose. The committee included representatives from the study leads, case study site assessment leads and key government institutions who would be responsible for integrating OECMs into national policy and practice, and reporting OECMs.

ASSESSMENT TOOL

The OECM assessment tool was developed to test the OECM characteristics at a site level. The assessment tool was informed by the IUCN's guidelines for Recognising and reporting other effective area-based conservation measures (IUCN-WCPA, 2019) and the CBD Decision 14/8 (CBD, 2018). The tool assessed sites against the OECM characteristics using 20 criteria questions. A three-grade rating scale (yes/meeting – green, partially meeting – orange, and no/not meeting – red) was used to assess each of the criteria questions. This type of analysis followed a similar analysis developed by the Canadian Council on Ecological Areas (CCEA, 2018)[3]. The rating scale allowed the tool to provide flexible indicators to accommodate the variability expected across various sites. The colour-grading scale also provided a visual overview of how closely a site met the OECM characteristic and where shortcomings existed.

The overall result for each site was determined by whether the site met all the characteristics, in which case it would qualify as an OECM. Sites that did not meet one or more criteria would not qualify as an OECM. A site that answered 'partially' to one or more criteria questions essentially would qualify as an OECM, albeit with certain caveats, and identifying areas needing further strengthening (Table 2). It must be noted that the global OECM methodology proposes to use a more rigorous approach to determining the final result (IUCN-WCPA, Forthcoming).

Of the nine sites assessed, the six qualifying sites constituted 59 per cent of the total 27,864 hectares assessed. The three sites that did not meet the OECM definition struggled to achieve the governance and/or management requirements. One of the privately-owned

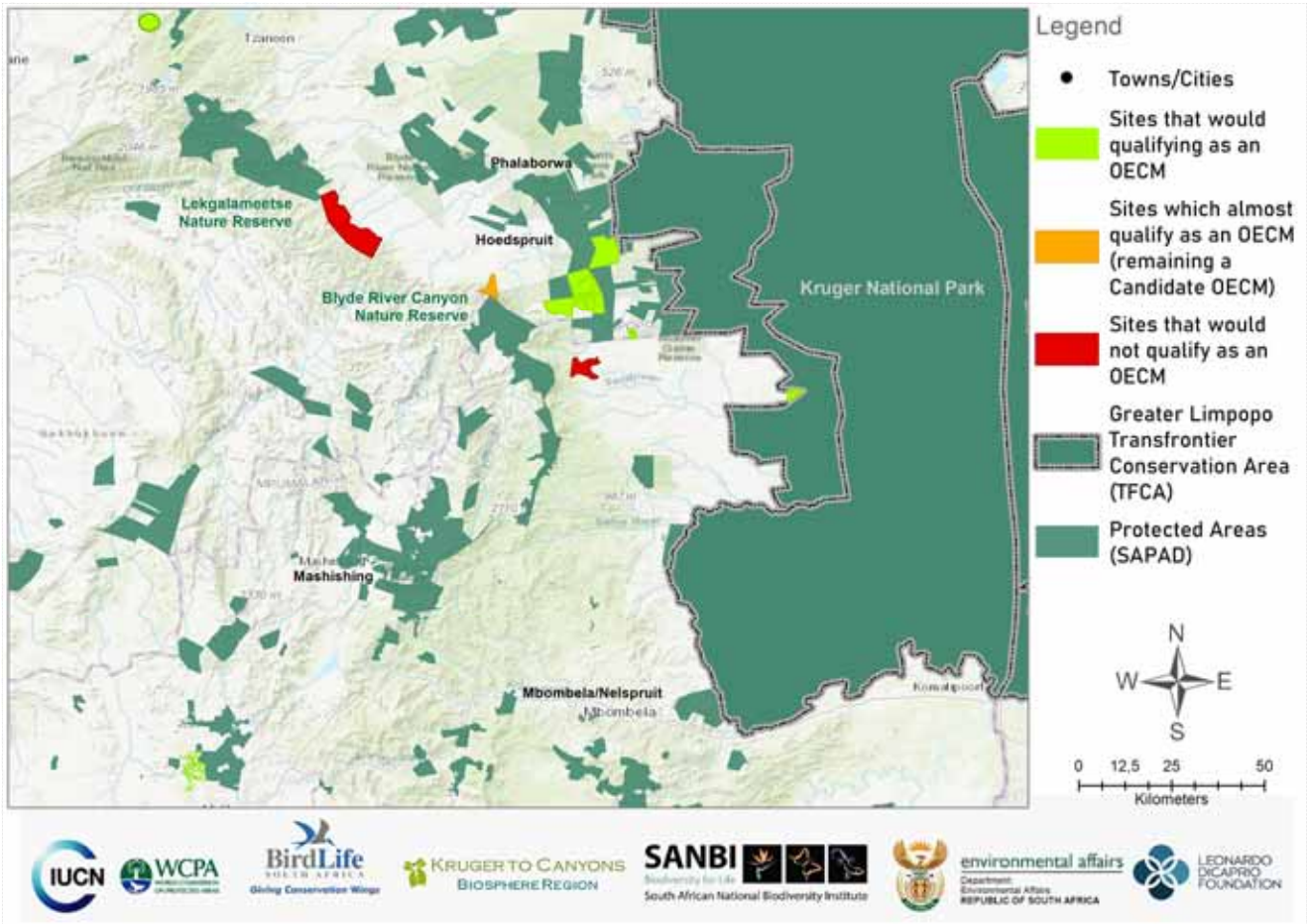

Figure 2. OECM case study assessment sites in relation to the protected area network and KBAs in the K2C Biosphere Region

sites indicated a willingness to develop the necessary management plan to remedy the shortcoming, while the two community-owned sites required fundamental improvements in governance and management.

The results from assessing the case study sites against the five key characteristics of an OECM, namely biodiversity value, geographically defined, governance, management and effectiveness, are summarised in the full country study report (Marnewick et al., 2020).

Several key lessons were learnt from trialling this assessment tool. First, the participants found the tool simple to use. Second, the site assessment took two hours on average to complete, not including any desktop data gathering pre-assessment. Third, the governance and/or management authorities responded very positively to the assessment process. Certain sites did enquire about the benefits of being recognised as an OECM, but none expressed any concerns about being recognised as an OECM. Fourth, the representatives of the sites being assessed understood the context of the criteria questions and were able to grade themselves confidently. The only exceptions were two of the community sites. In these cases, the traditional authorities (governance authorities) did not easily understand the context or requirements of the criteria questions. Consequently, questions needed to be rephrased several times. Therefore, it is recommended that when an assessment is proposed in a rural setting with community groups or Indigenous Peoples, a series of deeper issues are considered (Jonas et al., 2017), and revising or co-developing the assessment to ensure that it is locally appropriate, including in the respective dialect, may be required (Hill et al., 2020).

The assessment tool informed the development of the global assessment methodology, and the IUCN encourages countries to use and adapt the global assessment methodology for national contexts.

KEY EXAMPLES OF POTENTIAL OECMS

Given the intent of the CBD Aichi Target 11 to conserve areas of particular importance for biodiversity and ecosystem services, it is important to note that all nine case study sites held high biodiversity value as described through national or provincial systematic conservation planning (Critical Biodiversity Areas and Ecological Support Areas), and/or are recognised by global standards (KBAs).

The below candidate OECMs met the OECM characteristics based on the assessments conducted using the assessment tool and are examples of the different governance types identified in the list of potential OECMs. The names of sites and governance bodies have purposefully been omitted, unless explicit permission was given by that institution.

Candidate OECM 1: Community-owned land

Community site 1 was the only site of the three community-owned sites assessed that met all the OECM characteristics. This site is situated between two existing protected areas, which form part of the Greater Kruger open system (Figure 3). The site is governed by a Traditional Authority, strengthened by two parallel committees, namely a Community Development Forum (CDF) and the Farmers' Cooperative. The CDF and Farmers' Cooperative provide platforms for community members to have representation in how the livestock rangelands are managed. The CDF-elected members sign the CDF constitution and are registered with the Traditional Authority Office. The Farmers' Cooperative comprises community members who have signed a Conservation Agreement with a partnering NGO, Conservation South Africa (CSA), and use the rangelands for grazing their cattle.

CSA is assisting the community in developing and implementing a management plan aimed at improving grassland grazing and burning regimes for livestock farming, which is compatible with the conservation of the natural grasslands and savannah habitat and associated species. Conservation is a secondary management objective. While the community and CSA's conservation agreement is typically renegotiated annually, this is implemented under a three to five-year partnership project, which is often also renewed. The long-term objective is to partner the community's livestock production with a corporate-based, market-driven economic incentive scheme called 'Meat Naturally'.

This site has demonstrated the opportunity to use community–private sector partnerships, under the sustainable agriculture and wildlife economies, to drive

Candidate OECM 1. Community-owned land. The community nestled within the surrounding bushveld © ReWild Africa

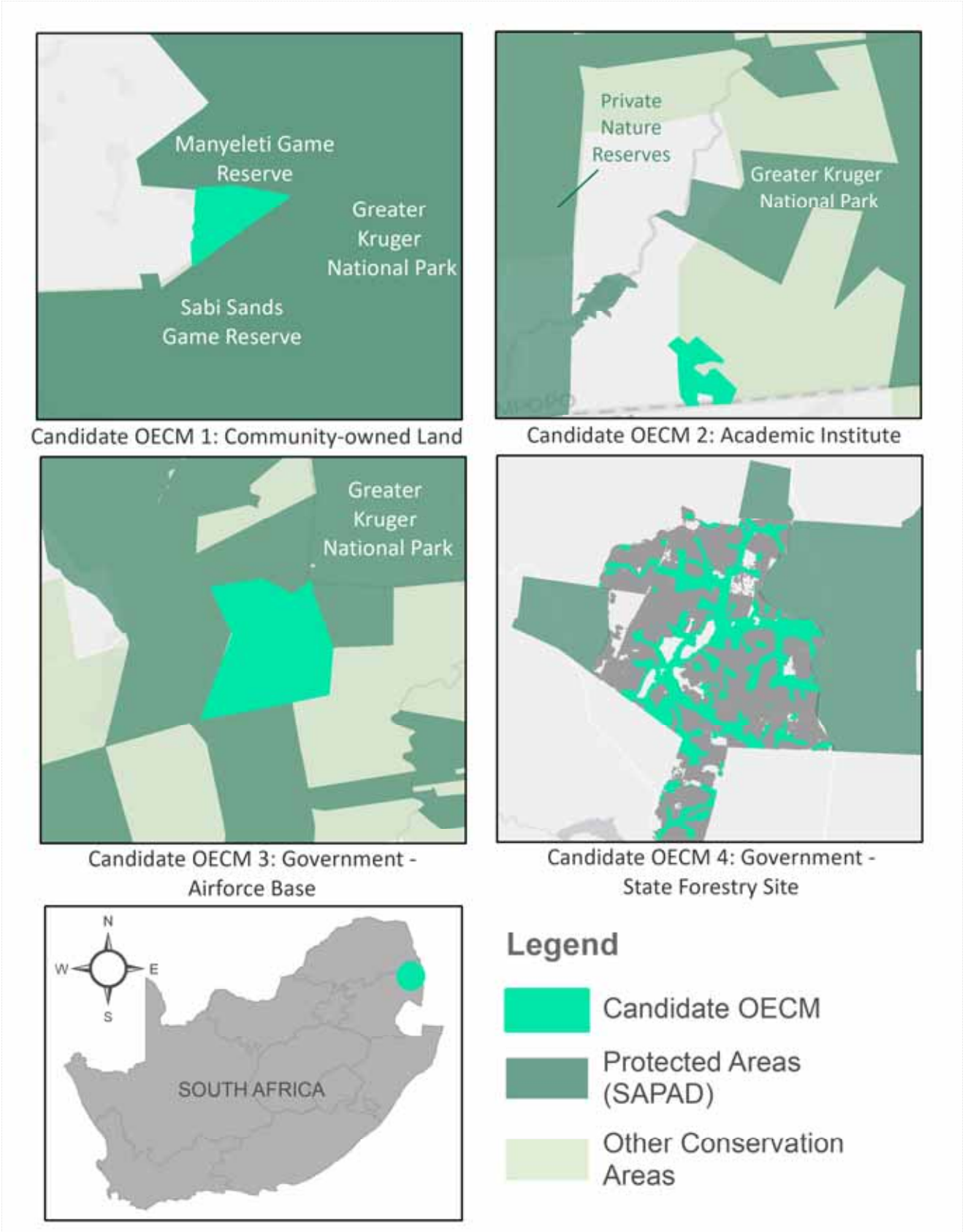

Figure 3. Candidate OECM sites

area-based conservation outcomes and recognise and support these sites as OECMs. This site clearly illustrates that when management objectives are intentionally aligned with sustainable land use, and governance mechanisms are strengthened, conservation outcomes are achieved.

Candidate OECM 2: Academic Institute

The academic research facility (Figure 3) is privately owned and governed by a university and is used for educational research purposes. The site is a Knowledge Hub for Rural Development, focusing on ecological and social research and training in the area. The university has demonstrated long-term intent through substantial investment in research and other infrastructure at the site. Research results also provide a better understanding and management of the associated savannah ecosystems. It conducts engagement and research involving rural communities and where possible staff are employed from local villages. Conservation is a secondary management objective as the site is managed in favour of the intact natural habitat. Ancestral gravesites on the site are also protected.

Candidate OECM 3: Government – Air Force Base

The air force base is situated between two existing protected areas which form part of the Greater Kruger open system (Figure 3). The 2,400 hectare natural buffer zone area around the military infrastructure, which is used for training military personnel, was assessed as a candidate OECM. This intact habitat acts as a buffer and corridor between the neighbouring protected areas. The governance authority is the South African National Defence Force. All state-owned land and infrastructure are ultimately under the Department of Public Works' custodianship, but the specific government departments (in this case the Defence Force) are given all operational rights. The property's governance is underpinned by South Africa's Defence Act, No 42 of 2002.

This buffer zone is managed as a conservation area, supporting various threatened savannah species. Conservation is a secondary management objective. All aspects of environmental management, such as habitat condition assessments, burning regimes and game counts, are stipulated in the environmental management plan. Given the site is governed and managed by the Defence Force, the site's status is intended to be in place for the long term, and most internal and external risks and threats can be managed. The only potential future threat is a reduction of state

Candidate OECM 2. Academic Institute. Research plot © ReWild Africa

funds for the site's management, but this is highly unlikely.

Candidate OECM 4: Government – State Forestry Site

The Department of Public Works owns this state-owned commercial forestry site. The site is governed in line with the Management of State Forest Act 128 of 1992, which gives the Department of Forestry, Fisheries and the Environment (DFFE) and SAFCOL (parastatal entity) the right to manage state forest land.

The National Forest Act 84 of 1998, Chapter 1, Section 1, states that the purposes of this Act are to "promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes". Chapter 2, Section 3, states the principles, "forests must be developed and managed so as to (i) conserve biological diversity, ecosystems and habitats; conserve natural resources, especially soil and water".
Significant tracts of intact wetland and grasslands occur at the site and act as a corridor in a much larger wetland and grassland system, fulfilling critical ecosystem services. Only the intact wetland and grassland system was assessed and would be reported as the OECM. The

Candidate OECM 4. Government - State Forestry Site. Wetlands

boundary of the wetlands and grasslands would therefore constitute the geographic boundary of the OECM (i.e. any commercial timber plantations would be excluded) (Figure 3). Specific conservation management objectives exist for these wetlands and grasslands and a dedicated environmental manager is employed to implement the environmental management plan for the natural habitat.

OPPORTUNITIES AND CHALLENGES

This study highlighted several opportunities offered through OECMs for promoting area-based conservation objectives in South Africa as well as the challenges to realise these. These core opportunities and challenges may be relevant to other countries. The key opportunities are summarised below.

The voluntary acceptance of the CBD's definition of OECMs by relevant government agencies and their support of stakeholders to assess and report sites as OECMs to the World Database on OECMs is imperative. Given their mandate, the DFFE can facilitate the institutionalisation of OECMs within South Africa's policy framework to ensure the alignment of OECMs with existing frameworks to recognise and report on conservation areas at a national level, as well as in meeting the international reporting requirements of the CBD.

For the OECM framework to strengthen a country's system of protected and conserved areas, the CBD Decision 14/8 (CBD, 2018) and any accompanying guidelines and assessment methodologies need to be aligned and integrated with the existing community of practice concerning the legal and practical recognition of unprotected conservation areas. In South Africa, this is underpinned by The Protected Areas Act and the biodiversity stewardship community of practice. OECMs could form part of the Biodiversity Stewardship Technical Working Group's mandate to undertake the integration, alignment, recognition, identification, reporting and strengthening of OECMs in South Africa.

Given international and national targets and proposed future targets for area-based conservation, South Africa

Candidate OECM 2. Academic Institute. Anti-poaching fence patrols around the property © ReWild Africa

may expand its network of protected areas and conservation areas. OECMs allow for existing initiatives, outside of protected areas, to be recognised, and to strengthen their governance and management mechanisms leading to biodiversity conservation. OECMs could facilitate a more inclusive area-based conservation network by allowing the inclusion of previously excluded or marginalised groups of land use types.

The CBD Aichi Target 11 (2010) refers to conserving "especially areas of particular importance for biodiversity and ecosystem services", and the CBD definition (CDB, 2018) refers to OECMs delivering "in situ conservation of biodiversity, with associated ecosystem functions and services...". For OECMs to deliver on these, they must first and foremost be identified based on their biodiversity attributes and ecosystem services value (Visconti et al., 2019). Given South Africa's extensive biodiversity spatial mapping and planning products, including the current national review and expansion of KBAs, these spatial products can be used to prioritise where OECM assessments should be focused. Noting that the extent of biodiversity mapping and prioritisation varies across national contexts, the best available biodiversity data should be used for OECM assessments.

Ecological infrastructure refers to naturally functioning ecosystems that deliver valuable services to people. Critical ecological infrastructure includes Strategic Water Source Areas vital to the national economy (WWF-SA, 2013). It is recommended that Strategic Water Source Areas be prioritised for identifying and assessing potential OECMs to foster a landscape approach to securing Strategic Water Source Areas, alongside protected areas and sustainable agriculture.

The CBD Decision 14/8 (CBD, 2018) and the IUCN guidelines (IUCN-WCPA, 2019) underscore that OECMs should be supported with measures to enhance the governance capacity of their legitimate authorities and thereby secure their positive and sustained outcomes for biodiversity. The OECM assessment process may be used to motivate governance and management improvements. It is noted that local communities have integrated governance mechanisms that have both opportunities and challenges which may be enhanced or addressed through OECM assessments. The OECM framework provides a suitable benchmark against which to evaluate and assess the level of support needed to strengthen these structures accordingly.

Many of the activities underpinning South Africa's Wildlife Economy, described under the Biodiversity Economy Strategy (DEA, 2016), are already promoting or potentially aligned with area-based conservation. Local communities are often the primary beneficiaries of the Wildlife Economy and the associated green jobs. Well-governed and sustained governance and management structures in these communities will vitally underpin their successful engagement in the Wildlife Economy. OECMs offer a framework by which to assess and guide the strengthening of the governance and management of these community-owned sites, and thereby support the Biodiversity Economy Strategy and the Land Reform and Biodiversity Stewardship Initiative[4]. Further investigation is needed to understand how OECMs may provide a global framework that can underpin legitimate, diverse and sustainable economic opportunities and conservation financing that merges with rural economies and in-situ biodiversity conservation outcomes. Using a global framework could address issues of risk for investors in various projects embedded in the Biodiversity Economy.

Results from this project indicate that South Africa has many potential OECMs and that each should be assessed at a site level. Key challenges will be mobilising additional capacity and resources for assessing, supporting and monitoring sites. Resources are already limited under biodiversity stewardship and there is a justifiable concern that resources may be diverted away from protected areas to OECMs. Therefore, partnerships between the public, private and civil society sectors are essential to assess OECMs collectively across the broader landscape. A strong ethos of collaboration already exists at national and provincial levels through biodiversity stewardship. Utilising the Biodiversity Stewardship Technical Working Group (TWG) and provincial level biodiversity stewardship working groups can mobilise capacity and resources for OECM assessments. Also, OECM assessments focused on areas or landscapes with a high probability of meeting the criteria are essential for maximising resources (Supplementary Online Material Table S2). The list of potential OECMs generated through this study should be a starting point to identify sites for assessment, particularly where there is direct alignment with biodiversity stewardship category 2. These mechanisms are also being implemented and designated by a broad community of practice that is well organised through the Biodiversity Stewardship TWG. Therefore, efforts to assess OECMs should be aligned with biodiversity stewardship, to ensure collaboration and to pool resources.

CONCLUSION

OECMs provide a global framework to recognise, complement and strengthen other conservation area designations and existing management and governance mechanisms, contributing to CBD Aichi Target 11 (and its post-2020 inheritor target). South Africa's national OECM review highlighted opportunities for South Africa and has generated lessons for other countries. Through proper technical and policy alignment, the OECM framework will facilitate the reporting of South Africa's conservation estate nationally and internationally, assisting with formalising conservation areas in South Africa. This alignment will also address potential challenges by facilitating resource use efficiency and mobilization, and mitigate the reporting of non-compliant sites. In addition, OECMs provide an opportunity to create more interconnected landscapes and seascapes in combination with protected areas. Significantly, they facilitate the inclusion of a diverse range of rights-holders and stakeholders contributing to area-based conservation. These include previously marginalised groups, land use types, and sectors. OECMs can play a role in supporting local economies that are simultaneously safeguarding biodiversity and ecological assets. They offer an opportunity to strengthen governance structures that can attract conservation finance investment. Looking ahead, OECMs offer South Africa a unique tool that addresses environmental, social and economic priorities. Sharing the lessons from South Africa's experience may also help other countries assess OECMs and the potential benefits OECMs offer landscapes across the African continent and globally.

ENDNOTES

1 Key Biodiversity Areas (KBAs) are the most important places in the world for species and their habitats (IUCN, 2016).

2 Protected areas on private or communal land.

3 This initial draft tool followed a similar assessment methodology to the tool developed by the Canadian Council on Ecological Areas which was shared with this project: a draft guidebook "… for the identification and for the application of IUCN Protected Area Categories" (CCEA, 2018).

4 The Land Reform and Biodiversity Stewardship Initiative (LRBSI) is a conservation and developmental initiative run in a tri -partnership by the Department of Rural Development and Land Reform (DRDLR), the Department of Forestry, Fisheries and Environment (DFFE) and the South African National Biodiversity Institute (SANBI).

SUPPLEMENTARY ONLINE MATERIAL

Online resources - Tables S1 and S2

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RESUMEN

En 2018, las Partes del Convenio sobre la Diversidad Biológica (CDB) adoptaron una definición y criterios para identificar otras medidas efectivas de conservación basadas en áreas (OMEC). Sudáfrica fue uno de los primeros países en emprender un examen general a nivel nacional de sus posibles OMEC. Los resultados de investigaciones anteriores ya estimaban que el 48,5% de los sitios de Áreas clave para la biodiversidad no protegidas de Sudáfrica podrían ajustarse a la definición de OMEC. Un estudio posterior de diversos grupos interesados brindó la oportunidad de evaluar la concordancia entre las OMEC y las políticas y prácticas nacionales de conservación, para determinar de modo más preciso el alcance potencial de las OMEC, y si estas pueden reforzar el patrimonio colectivo de conservación del país. Este estudio arrojó varias conclusiones. En primer lugar, el marco de las OMEC facilita la formalización, expansión e información relacionada con el patrimonio de las áreas de conservación de Sudáfrica. En segundo lugar, las OMEC refuerzan los paisajes terrestres y marinos interconectados junto a las áreas protegidas. En tercer lugar, las OMEC pueden incluir una amplia gama de titulares de derechos que contribuyen a la conservación basada en áreas, incluidos grupos, tipos de uso de la tierra y sectores anteriormente marginados. En cuarto lugar, las OMEC desempeñan una función de apoyo a las economías locales que simultáneamente salvaguardan el patrimonio medioambiental. Sigue planteando dificultades el aprovechamiento de los recursos humanos y financieros para evaluar, informar, custodiar y apoyar a las OMEC, sin desviar recursos de otras prioridades de conservación, especialmente en lo concerniente a las áreas protegidas.

RÉSUMÉ

En 2018, les Parties à la Convention sur la diversité biologique (CDB) ont adopté une définition et des critères pour identifier les autres mesures de conservation efficaces par zone (AMCE). L'Afrique du Sud est l'un des premiers pays à entreprendre un examen national complet de ses AMCE potentielles. Les résultats de recherches antérieures avaient estimé que 48,5 pour cent des sites situés dans les zones clés de la biodiversité non protégées d'Afrique du Sud pourraient potentiellement répondre à la définition de l'AMCE. Une étude multipartite ultérieure a permis d'évaluer l'alignement entre les AMCE et les politiques et pratiques nationales de conservation, d'étudier davantage l'étendue potentielle des AMCE et de déterminer si les AMCE pourront renforcer le domaine de conservation au niveau national. Cette étude a abouti à plusieurs conclusions. Premièrement, que le cadre des AMCE facilite la formalisation, l'extension et le reporting des aires de conservation en Afrique du Sud. Deuxièmement, que les AMCE renforcent les environnements terrestres et maritimes interconnectés se trouvant près des aires protégées. Troisièmement, que les AMCE peuvent contenir un large éventail d'éléments qui impactent la conservation par zone, tels les groupes marginalisés, des modes d'utilisation des terres et des secteurs. Quatrièmement, que les AMCE jouent un rôle dans le soutien des économies locales qui protègent les actifs environnementaux. Un défi de taille demeure : celui de mobiliser les ressources financières et humaines pour évaluer, rendre compte, suivre et soutenir les AMCE, sans détourner les ressources d'autres priorités de conservation, en particulier des aires protégées.

EQUITABLE AND EFFECTIVE AREA-BASED CONSERVATION: TOWARDS THE CONSERVED AREAS PARADIGM

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Affiliations continued on page 83

ABSTRACT

In 2018, the Parties to the Convention on Biological Diversity (CBD) adopted a decision on protected areas and other effective area-based conservation measures (OECMs). It contains the definition of an OECM and related scientific and technical advice that has broadened the scope of governance authorities and areas that can be engaged and recognised in global conservation efforts. The voluntary guidance on OECMs and protected areas, also included in the decision, promotes the use of diverse, effective and equitable governance models, the integration of protected areas and OECMs into wider landscapes and seascapes, and mainstreaming of biodiversity conservation across sectors. Taken as a whole, the advice and voluntary guidance provides further clarity about the CBD Parties' understanding of what constitutes equitable and effective area-based conservation measures within and beyond protected areas and provides standardised criteria with which to measure and report areas' attributes and performance. This policy perspective suggests that this CBD decision represents further evidence of the evolution from the 'new paradigm for protected areas' to a broader 'conserved areas paradigm' that embodies good governance, equity and effective conservation outcomes and is inclusive of a diversity of contributions to conservation within and beyond protected areas.

Key words: protected areas, OECM, post-2020 framework, biodiversity, good governance, effective conservation

INTRODUCTION

In 2010, Parties to the CBD adopted the Strategic Plan for Biodiversity 2011–2020, which contained 20 Aichi Biodiversity Targets (CBD, 2010). Target 11 called on Parties to conserve 17 per cent of terrestrial and inland water areas and 10 per cent of coastal and marine areas by 2020 through 'well connected systems of protected areas and other effective area-based conservation measures'. This was the first reference within the CBD of the concept of 'other effective area-based conservation measures' (OECMs). Parties subsequently articulated scientific and technical advice on OECMs in 2018 and adopted the following definition:

> A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values. (CBD Decision 14/8, 2018: Paragraph 2)

OECMs complement protected areas across landscapes and seascapes and – like protected areas – can be governed by diverse authorities and arrangements, including national and sub-national governments, private entities, Indigenous Peoples, local communities or through shared governance arrangements (IUCN-

WCPA, 2019). Yet, they are conceptually distinct; while a protected area must have conservation of biodiversity as its primary objective (Dudley, 2008; Lopoukhine & Dias, 2012), an OECM must achieve the effective, long-term *in situ* conservation of biodiversity even though conservation may not be a primary objective (IUCN-WCPA, 2019)[1]. Examples may include some sacred or cultural sites and areas managed for their ecosystem functions and services.

Parties to the CBD are currently negotiating the post-2020 global biodiversity framework, which will replace the 2011–2020 Strategic Plan (CBD, 2020). Target 2 is the new area-based conservation target within the 'updated zero draft' of the framework, (i.e. the successor to Aichi Target 11). The current draft of Target 2 calls on Parties to achieve the following (CBD, 2020: 5):

> By 2030, protect and conserve through well connected and effective system [sic] of protected areas and other effective area-based conservation measures at least 30 per cent of the planet with the focus on areas particularly important for biodiversity.

A range of proposals have been made to inform the ongoing negotiations. Despite their differences in emphasis, there is convergence around a set of core principles, including that area-based conservation efforts should: 1) respect human rights and incorporate good governance; 2) achieve long-term conservation of biodiversity, including ecosystem functions and services; 3) prioritise intact ecosystems as well as areas that are key for the persistence of biodiversity within and beyond protected areas; and 4) uphold local and Indigenous values, knowledge, practices and institutions that are fundamental for in situ biodiversity conservation (Bhola et al., 2021).

This paper intends to augment these proposals and contribute to the negotiation and subsequent implementation of the post-2020 global biodiversity framework through an analysis of CBD Decision 14/8 – with a focus on good governance and conservation effectiveness. We argue that the CBD's updated guidance and scientific and technical advice provides further clarity about the Parties' understanding of what constitutes equitable and effective area-based conservation measures within and beyond protected areas and provides standardised criteria with which to measure and report their attributes and performance. We conclude by engaging with the term 'conserved areas', which remains undefined despite being referenced in CBD Decision 14/8 and other international policy documents. We propose that the term 'conserved areas' is potentially useful shorthand for area-based conservation that is both equitable and effective, and propose that this issue is further discussed in an inclusive manner.

THE CBD'S UPDATED GUIDANCE AND ADVICE ON PROTECTED AREAS AND OECMs

Decision 14/8 is the CBD Parties' most comprehensive decision on area-based conservation since the adoption of the Programme of Work on Protected Areas in 2004 (PoWPA; CBD, 2004a). In addition to adopting the above definition of OECMs, four Annexes to Decision 14/8 set out voluntary guidance on protected areas and OECMs and scientific and technical advice on OECMs. These are summarised in this section.

Annex I provides voluntary guidance on the integration of protected areas and OECMs into wider landscapes and seascapes. It also calls for mainstreaming protected areas and OECMs into key sectors, including agriculture, fisheries, forestry, mining, energy, tourism and transportation. Parties are called upon to support sectoral actors to integrate protected areas and OECMs within planning for lands and waters under their management as well as respecting existing protected areas, OECMs and other territories, lands and waters governed by Indigenous Peoples, local communities and private actors in their operations.

Annex II provides voluntary guidance on effective governance models for management of protected areas, conserved areas and OECMs and sets out a number of steps for enhancing and supporting governance diversity[2]. It notes the particular circumstances of territories and areas under the governance of Indigenous Peoples and local communities, and calls for these steps to be taken only on the basis of free, prior and informed consent (FPIC) and based on respect for their rights, knowledge and institutions. Annex II also states that good governance principles should be applied to protected areas and OECMs. It explains that equity is one element of good governance, and sets out the three dimensions of equity, namely: recognition, procedure and distribution (Figure 1).

Annex III, which is the focus of the next section of this paper, sets out scientific and technical advice on OECMs, including criteria for identifying and reporting against international biodiversity targets.

Annex IV provides a set of considerations in achieving Aichi Biodiversity Target 11 (which was still then extant) in marine and coastal areas. Among other things, it calls for adequate monitoring and evaluation frameworks to measure whether areas are achieving effective, long-term conservation outcomes.

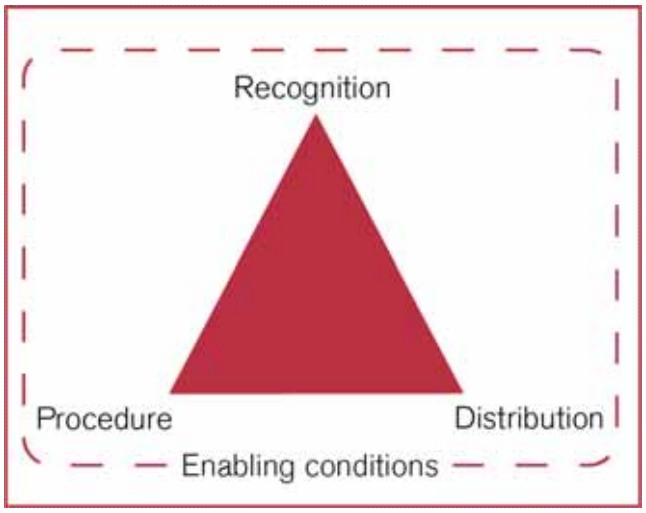

Figure 1. The three dimensions of equity embedded within a set of enabling conditions (CBD, 2018, Annex II after Franks & Schreckenberg, 2016, http://pubs.iied.org/17344IIED)

The integration of protected areas and OECMs into wider landscapes and seascapes (Annex I) and considerations in achieving Target 11 in marine and coastal areas (Annex IV) are important issues. However, in this paper we focus on good governance and conservation effectiveness and we therefore concentrate our analysis and commentary on Annexes II and III.

EFFECTIVE AREA-BASED CONSERVATION MEASURES, INCLUDING CONSIDERATIONS OF EQUITY

Since 2010, when the Parties to the CBD incorporated OECMs into Target 11, the lack of a definition and criteria for OECMs hindered progress on this aspect of the Target (Jonas et al., 2014a). Annex III of CBD Decision 14/8 addresses this by setting out four criteria for identifying OECMs, namely:

A. the area is not currently recognised as a protected area;
B. the area is governed and managed;
C. the area achieves sustained and effective contribution to *in situ* conservation of biodiversity; and
D. associated ecosystem functions and services and cultural, spiritual, socio-economic and other locally relevant values are respected, upheld and supported (CBD, 2018: 12–13).

These four criteria are further articulated through 10 sub-criteria and 26 indicators (set out in Section B, Annex III, Decision 14/8). The criteria and related guidance enable the identification and recognition of OECMs 'in a flexible way and on a case-by-case basis' (CBD, 2018: 10). This represents important progress towards promoting more inclusive and diverse approaches to achieve the long-term *in situ* conservation of biodiversity (Jonas et al., 2018; IUCN-WCPA, 2019).

CBD Decision 14/8 also produced an outcome that has yet to be fully appreciated by Parties, rightsholders and stakeholders. Because the criteria and guidance can be disaggregated and understood as individual elements, by defining and setting out criteria for other effective area-based conservation measures (Criteria A–D), Parties to the CBD have also in effect provided voluntary guidance about what constitutes effective area-based conservation measures (Criteria B–D). As such, while Criterion A is only relevant to OECMs, Criteria B–D can also be applied on a voluntary basis to protected areas.

Importantly, the criteria and guidance do not override the CBD or IUCN definitions of a protected area. Instead, we are able to draw on Decision 14/8 – together with broader guidance on protected areas and OECMs from the CBD (including the Akwé: Kon Voluntary Guidelines – CBD, 2004b), the IUCN and others – and apply it to areas, flexibly and with regard to their specific social-ecological contexts, so as to measure and evaluate their attributes and performance, identify aspects of governance and management in need of improvement, and celebrate success stories.

IMPLICATIONS OF THE CBD VOLUNTARY GUIDANCE AND SCIENTIFIC AND TECHNICAL ADVICE

The possible application of Criteria B–D on effective area-based conservation measures to both OECMs and protected areas has several implications for all forms of conservation, including areas that are conserved *de facto* outside of these frameworks. In this context, we explore four key issues – good governance, conservation effectiveness, assessment and reporting – and then discuss some of the implications specifically for non-state actors, namely, Indigenous Peoples and/or local communities, and private landowners.

Good governance and conservation effectiveness: In line with broader international policy within the CBD and IUCN, Annexes II and III of Decision 14/8 recognise that good governance is an essential requirement for effective conservation and that protected areas and OECMs should be characterised by diverse, effective and equitable governance models (as ends in themselves). The recent trajectory of CBD guidance has been increasingly inclusive of diverse approaches to how areas are managed. We infer from

Table 1. Criteria B to D of Section B, Annex III (CBD Decision 14/8: 12), provide guidance on effective area-based conservation measures

Criterion B: Area is governed and managed	
Geographically defined space	• Size and area are described, including in three dimensions where necessary. • Boundaries are geographically delineated.
Legitimate governance authorities	• Governance has legitimate authority and is appropriate for achieving *in situ* conservation of biodiversity within the area. • Governance by indigenous peoples and local communities is self-identified in accordance with national legislation and applicable international obligations. • Governance reflects the equity considerations adopted in the Convention. • Governance may be by a single authority and/or organization or through collaboration among relevant authorities and provides the ability to address threats collectively.
Managed	• Managed in ways that achieve positive and sustained outcomes for the conservation of biological diversity. • Relevant authorities and stakeholders are identified and involved in management. • A management system is in place that contributes to sustaining the *in situ* conservation of biodiversity. • Management is consistent with the ecosystem approach with the ability to adapt to achieve expected biodiversity conservation outcomes, including long-term outcomes, and including the ability to manage a new threat.
Criterion C: Achieves sustained and effective contribution to *in situ* conservation of biodiversity	
Effective	• The area achieves, or is expected to achieve, positive and sustained outcomes for the *in situ* conservation of biodiversity. • Threats, existing or reasonably anticipated ones are addressed effectively by preventing, significantly reducing or eliminating them, and by restoring degraded ecosystems. • Mechanisms, such as policy frameworks and regulations, are in place to recognize and respond to new threats. • To the extent relevant and possible, management inside and outside the other effective area-based conservation measure is integrated.
Sustained over long term	• The other effective area-based conservation measures are in place for the long term or are likely to be. • 'Sustained' pertains to the continuity of governance and management and 'long term' pertains to the biodiversity outcome.
***In situ* conservation of biological diversity**	• Recognition of other effective area-based conservation measures is expected to include the identification of the range of biodiversity attributes for which the site is considered important (e.g. communities of rare, threatened or endangered species, representative natural ecosystems, range restricted species, key biodiversity areas, areas providing critical ecosystem functions and services, areas for ecological connectivity).
Information and monitoring	• Identification of other effective area-based conservation measures should, to the extent possible, document the known biodiversity attributes, as well as, where relevant, cultural and/or spiritual values, of the area and the governance and management in place as a baseline for assessing effectiveness. • A monitoring system informs management on the effectiveness of measures with respect to biodiversity, including the health of ecosystems. • Processes should be in place to evaluate the effectiveness of governance and management, including with respect to equity. • General data of the area such as boundaries, aim and governance are available information.
Criterion D: Associated ecosystem functions and services and cultural, spiritual, socio-economic and other locally relevant values	
Ecosystem functions and services	• Ecosystem functions and services are supported, including those of importance to indigenous peoples and local communities, for other effective area-based conservation measures concerning their territories, taking into account interactions and trade-offs among ecosystem functions and services, with a view to ensuring positive biodiversity outcomes and equity. • Management to enhance one particular ecosystem function or service does not impact negatively on the sites [sic] overall biological diversity.
Cultural, spiritual, socio-economic and other locally relevant values	• Governance and management measures identify, respect and uphold the cultural, spiritual, socio-economic, and other locally relevant values of the area, where such values exist. • Governance and management measures respect and uphold the knowledge, practices and institutions that are fundamental for the *in situ* conservation of biodiversity.

this that Parties' emphasis on 'management systems' arises from the understanding that effective conservation can result from a diversity of approaches, including those applied by Indigenous Peoples, local communities and private entities, many of which are also imbued with cultural and spiritual values consistent with conservation (Verschuuren et al., 2021).

The CBD's guidance on what constitutes long-term, effective *in situ* conservation of biodiversity – set out in Criterion C of Annex III (see Table 1) – is an important new addition to existing guidance on management effectiveness (CBD, 2004a). Parties to the CBD also agree that 'effective' areas should be 'governed and managed in ways that achieve positive and sustained long term outcomes for the *in situ* conservation of biodiversity' (CBD, 2018: 12). Criterion C therefore underscores that the central indicator of effective area-based conservation is not area coverage, *per se*, but the areas' governance qualities, biodiversity values and conservation outcomes.

Assessing and reporting equitable and effective area-based conservation: Assessing and reporting on area-based conservation will likely continue to be an important, yet challenging, issue in the implementation of the post-2020 global biodiversity framework (Visconti et al., 2019; Geldmann et al., 2021). Reporting by national actors on Target 11, achieved via the World Databases on Protected Areas and OECMs, included some protected areas that are currently not effective, and/or do not meet the CBD's latest guidance on good governance and equity (Geldmann et al., 2019; Visconti et al., 2019; Zafra Calvo & Geldmann, 2020). In the context of the post-2020 global biodiversity framework, we suggest it may be useful to distinguish, on the one hand, between all the protected areas and OECMs reported under (future) Target 2 and, on the other, the subset that meet Criteria B–D and other standards set out in the CBD's guidance and advice in Decision 14/8. If applied, efforts should be made to ensure this approach is implemented in ways that catalyse action within systems or sites that do not yet meet the criteria, without placing undue criticism on them or undermining existing or future efforts. Any approach should be diagnostic and aimed at identifying ways in which a site can be improved and, ideally, promote the attainment of appropriate resources and support[3]. We anticipate that this may spur a welcome shift towards increasing tangible support for good governance, equity, effective management and conservation outcomes and promote increased reflection and learning at local levels.

Living midden site, Tasmanian Wilderness World Heritage Area (Australia), which covers 1.6 million hectares of temperate wilderness and Aboriginal heritage © Emma Lee

One means to achieve this is by application of the IUCN Green List of Protected and Conserved Areas Standard (Hockings et al., 2019) as an international benchmark for what constitutes 'effectiveness'. The Green List Standard has four components – good governance, sound design and planning, effective management and successful conservation outcomes – and subsidiary criteria and indicators that also map closely to Criteria B–D in Decision 14/8. Importantly, the Green List Standard recognises that the fourth component ('successful conservation outcomes') is, to a large extent, dependent on achieving the first three. Further elaborating the alignment between the CBD's guidance and the Green List will further underscore its relevance to helping deliver global conservation targets.

The processes required to assess, monitor and report against the CBD's guidance and advice in Decision 14/8 will likely be resource intensive, and this issue has been acknowledged in relation to the Green List (Geldmann et al., 2021). Decision 14/8's guidance and advice should neither be used in ways that undermine an area's governance and management towards achieving conservation objectives, nor in ways that create perverse incentives or outcomes, such as de-gazettement of sites that temporarily do not meet the criteria (Mascia &

Pailler, 2011; Golden Kroner et al., 2019). It will therefore be important to balance the application of the CBD's guidance and advice between, on the one hand, objectivity, rigour and consistency and, on the other, inclusivity, simplicity and flexibility; incentivising ameliorative actions without burdening already overworked and underfunded governance and management authorities. While this balance will be negotiated at the national-to-local levels, international guidance can also assist in promoting good practice. Lessons learned from the Green List, tools such as Site-level Assessment of Governance and Equity (IIED, 2021) and related mechanisms (Franks et al., 2014; Booker & Franks, 2019), and initiatives such as Key Biodiversity Areas and Ecologically or Biologically Significant Marine Areas can usefully inform this work. Implementing Decision 14/8 presents an opportunity to promote diverse forms of area-based conservation that are based upon respect for human rights and holistically informed by evidence, thereby supporting diverse, effective and resilient conservation systems.

Implications for Indigenous Peoples and/or local communities: Indigenous Peoples' rights are clearly set out in human rights law (ILO Convention No. 169, 1989; UNDRIP, 2007) and, together with local communities, are recognised for their role in achieving the objectives of the convention (CBD, 1992, Articles 8(j) and 10(c); and numerous decisions since).[4] According to available data at the time of publication, 1,534 protected areas worldwide are recorded as being governed by Indigenous Peoples and/or local communities (UNEP-WCMC & IUCN, 2021). Included in this number are areas such as the Australian Indigenous Protected Areas Program (Rose, 2012; Davies et al., 2013), as well as many protected areas that directly benefit Indigenous Peoples and local communities. However, there is also documentation of the historical and ongoing negative impacts of establishment, governance and management of some protected areas on Indigenous Peoples and local communities and on the areas they conserve through their own self-determined systems, including physical harm, destruction of property and forced relocation (Lee, 2015; Tauli-Corpuz, 2016). For this reason, it is notable that Decision 14/8 references 'rights' or 'rights-holders'[5] a total of 30 times, compared to only two such references in the PoWPA (CBD, 2004a).[6] This illustrates the ever-increasing emphasis on human rights within conservation law, policy and practice, both as fundamental standards (ends) and as enabling conditions for effective area-based conservation (means). The emphasis within Decision 14/8 on rights, legitimate and equitable governance, cultural and spiritual values and knowledge, practices and institutions affirms Indigenous Peoples' and local communities' long-held demands that these are respected and upheld in the context of conservation initiatives. State actors and business enterprises have the responsibility to protect and respect rights and remedy infringements (Ruggie, 2011) and these responsibilities extend to non-governmental organisations and funders engaged in conservation initiatives (Jonas et al., 2014b).

OECMs present an important additional means by which to recognise and support the diverse contributions of Indigenous Peoples' and local communities' territories and areas to nature conservation (IUCN-WCPA, 2019). We suggest that this is because OECMs, as a conceptual framework, is more analogous to a set of standards than a designation. If applied as a set of standards, it will more likely support existing governance arrangements, as required by Decision 14/8. The CBD guidance aligns with calls from Indigenous Peoples and local communities that they should first and foremost have their rights fully recognised, including substantive and procedural rights relating to self-determination and self-governance of their territories and areas. Only once this condition has been met should they be asked or invited to contribute to national or international biodiversity targets (Indigenous Circle of Experts, 2018). If achieved, this approach provides another opportunity in a broader suite of strategies for Indigenous Peoples and local communities to demonstrate that areas they manage conserve biodiversity in ways that also uphold their rights to self-determination (including to give or withhold FPIC) and self-governance, including use of their own languages, systems and practices such as Indigenous and local names. If used and applied with these considerations in mind, the guidance and advice in the annexes to Decision 14/8 could help promote plural, reflexive and restorative approaches that build – rather than constrain – conservation outcomes and enable a diversity of spaces, places and worldviews for *in situ* conservation to thrive.

Notwithstanding this potential, concerns remain that OECM-related advice could also be applied in ways that reinforce existing power structures and mirror the negative consequences of some protected areas, including the infringement of human rights (Jonas et al., 2017; Waithaka & Warigia Njoroge, 2018). It is therefore critically important that assessment methods and indicators are applied on the basis of FPIC and in ways that are culturally and contextually grounded (Hill et al., 2020). To this end they need either to be developed and undertaken by Indigenous Peoples and local communities or by those they have selected. In

Canadian Forces Base Shilo Landscape (Manitoba, Canada), was one of the world's first OECMs to be identified and reported. It conserves approximately 21,138 hectares of sand prairie habitat © Department of National Defense, Canada

light of the global importance of biodiversity conserved by Indigenous Peoples (Garnett et al., 2018; Fa et al., 2020; O'Bryan et al., 2020), the focus on human, territorial and natural resource rights in CBD Decision 14/8 is critically important at a time when, on the one hand, government agencies are exploring the expansion of their respective conservation estates and, on the other, industrial pressures continue to intensify.

Implications for private landowners: As considered above in relation to Indigenous Peoples and local communities, there exist similar kinds of opportunities and risks for private landowners, including that OECM-related frameworks and processes could be applied in ways that infringe upon their rights. Although a critical element of including privately-governed OECMs and privately protected areas (PPAs) in global databases is ensuring agreement from landholders is sought and given (Bingham et al., 2017; Mitchell et al., 2018; IUCN-WCPA, 2019), there are instances where this does not occur (Clements et al., 2018). New obligations with regards to CBD-defined monitoring requirements and assessments of equitable governance would need to be clearly and transparently outlined, agreed to and progressively addressed by private landowners. There are currently 16,223 reported PPAs globally (UNEP-WCMC & IUCN, 2021) and many more that remain unreported (Fitzsimons, 2015; Bingham et al., 2017), and therefore such processes represent a sizeable task. There is a risk that any additional requirements for PPAs, on top of existing monitoring and reporting obligations, may dissuade future designation or recognition of PPAs or OECMs on private land, including due to other capacity limitations such as time or staff budget (e.g., Fitzsimons & Carr, 2014). Incentives for the creation, management and reporting of PPAs or OECMs on private land – including for jurisdictional contributions to CBD commitments – should be created or expanded (e.g., financial incentives: Smith et al., 2016), acknowledging differing motivations for establishing and participating in such schemes (Selinske et al., 2019).

Implications for OECMs managed across different economic sectors: OECMs represent a new opportunity to recognise biodiversity conservation potential from a wider range of spatial management measures than ever before, particularly those managed by actors operating

across a range of economic sectors. There is now a clear opportunity for the uptake of the CBD criteria discussed here by sectoral actors, to better ensure that biodiversity conservation is an outcome of their management of lands, inland waters, coasts and marine areas. Progress in this regard is highly relevant to reconciling biodiversity conservation and sustainable development goals.

CONSERVED AREAS

Decision 14/8 uses the term 'conserved areas' 19 times and it also appears in several other prominent international policy documents (e.g., IUCN, 2014, 2016). Yet in every instance it is used in the absence of clarity about its meaning. Several publications suggest definitions for 'conserved areas' that could help address this issue (Borrini-Feyerabend & Hill, 2015; IUCN, WCPA & ASI, 2019; Jonas & Jonas, 2019). Of these, however, only one links ecological outcomes with governance and management (IUCN, WCPA & ASI, 2019). In light of Decision 14/8, we propose an additional approach for consideration; namely, that the term 'conserved areas' be used to refer to areas that align broadly with the CBD's guidance and advice on good governance and effective area-based conservation. 'Conserved areas' would refer to, but not be limited to, protected areas and OECMs that are equitably governed and achieve long-term conservation outcomes (including ecosystem functions). The simplicity and accessibility of this formulation may render the term 'conserved area' useful to a wide range of groups who are working to engage, animate and inspire people about equitable and effective conservation, in ways that the use of more technical terms fails to achieve. We recommend that this issue should be further considered through an inclusive process.

TOWARDS A CONSERVED AREAS PARADIGM

CBD Decision 14/8 represents a new high-water mark for international law and policy on protected areas and OECMs. It underscores that conservation initiatives should be founded on respect for human rights, good governance, effective management and long-term biodiversity outcomes, and be inclusive of diverse contributions to conservation within and beyond protected areas. This is especially important given that urgent, equitable and effective action is required to stem the loss of biodiversity, restore degraded ecosystems, improve ecosystem resilience and address climate change, including in relation to social inequalities (IPCC, 2014; IPBES, 2019).

In closing, we are compelled to ask: what does Decision 14/8 represent in the context of the evolution of equitable and effective conservation? Broadly put, from 2001–2009, international biodiversity law and policy embraced human rights and equity through the IUCN Vth World Parks Congress (IUCN, 2003) and the PoWPA (CBD, 2004a). Furthermore, the 'new paradigm for protected areas' (Phillips, 2003) emerged as governance was expanded to include Indigenous Peoples and local communities as legitimate governance authorities, in addition to state and private actors, under all management types (Borrini-Feyerabend et al., 2006; Dudley, 2008). From 2010–2017, guidance was developed to help implement the new paradigm, focusing on territories and areas conserved by Indigenous Peoples and local communities (Borrini-Feyerabend et al., 2013a, 2013b; Kothari et al., 2012; Jonas, 2017) and PPAs (Stolton et al., 2014; Mitchell et al., 2018), and the groundwork was laid for significantly expanding area-based conservation to encompass 'other effective area-based conservation measures' (CBD, 2010, 2018). In 2018, CBD Decision 14/8's engagement with good governance and conservation effectiveness provides increased focus on these twin goals across protected areas and OECMs. Decision 14/8 also marks a critical step forward for the recognition of the role of

A bottlenose dolphin in Jervis Bay Marine Park (New South Wales, Australia), which covers approximately 215 square kilometres and spans over 100 kilometres of coastline and adjacent oceanic, embayment and estuarine waters © Harry Jonas

actors operating across different economic sectors in international area-based conservation.

In sum, over the past twenty years the international law and policy of area-based conservation has evolved from a model largely dominated by state-governed protected areas to one that is more inclusive of non-state actors and efforts occurring beyond protected areas, more explicit about its recognition of and support for diverse, effective and equitable forms of governance, and increasingly focused on effective and long-term *in situ* conservation outcomes. The guidance and advice provided by the Parties to the CBD in Decision 14/8 represents a meaningful contribution to the transformative changes required to address our current interconnected planetary crises (IPBES, 2019; CBD, 2020). Giving rise to the new conserved areas paradigm – in effect, fusing the conservation and sustainable use of biodiversity and ecosystem services with recognition of human rights and cultural and spiritual values – can become a unifying project and common cause for building alliances for the future of our planet.

ENDNOTES

[1]While the general rule is that an area should deliver effective conservation outcomes, the guidance also states that an area should "deliver, or be expected to deliver, …". This issue will be dealt with in a follow-up paper.

[2]Notably, some aspects of Decision 14/8 are inconsistent.

[3]There is precedent for this type of review, as the Paris Agreement Committee on Compliance, operationalised in 2019, can receive complaints regarding State compliance.

[4]'Indigenous Peoples' and 'local communities' are two groups with distinct foundations for their rights. In addition, peasants' rights are set out in the UN Declaration on the Rights of Peasants and other People Working in Rural Areas (2018) but are not discussed in this paper.

[5]In the context of protected areas, 'rights holders' are actors with legal or customary rights to natural resources and land, in accordance with national legislation (CBD, 2018).

[6]The outcome is testament to the work of the International Indigenous Forum on Biodiversity (https://iifb-fiib.org/) in collaboration with supporting organisations and Parties under the auspices of the CBD.

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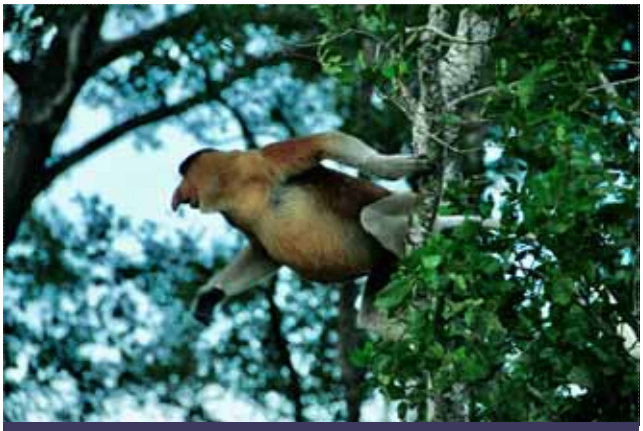

A proboscis monkey in a riparian reserve governed by an oil palm company, which is a potential OECM, in the Lower-Kinabatangan Segama Wetlands Ramsar Site (Sabah, Malaysia) © Harry Jonas

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RESUMEN

En 2018, las Partes del Convenio sobre la Diversidad Biológica (CDB) adoptaron una decisión sobre las áreas protegidas y otras medidas efectivas de conservación basadas en áreas (OMEC). Contiene la definición de una OMEC y el asesoramiento científico y técnico que ha ampliado el alcance de las autoridades encargadas de la gobernanza y las esferas que pueden ser integradas y reconocidas en los esfuerzos de conservación mundial. Las orientaciones voluntarias sobre las OMEC y las áreas protegidas, también incluidas en la decisión, promueven el uso de modelos de gobernanza diversos, efectivos y equitativos, la integración de las áreas protegidas y las OMEC en paisajes terrestres y marinos más amplios, y la incorporación de la conservación de la biodiversidad en todos los sectores. En su conjunto, el asesoramiento y las orientaciones voluntarias aportan una mayor claridad sobre la comprensión de las Partes del CDB de lo que constituyen las medidas de conservación equitativas y efectivas basadas en áreas, dentro y fuera de las áreas protegidas, y proporcionan criterios estandarizados para medir e informar sobre los atributos y el desempeño de las áreas. Esta perspectiva política sugiere que esta decisión del CDB representa una prueba más de la evolución del "nuevo paradigma para las áreas protegidas" hacia un "paradigma más amplio para las áreas conservadas", que refleja buena gobernanza, equidad y resultados eficaces en materia de conservación, y que incluye una diversidad de contribuciones a la conservación dentro y fuera de las áreas protegidas.

RÉSUMÉ

En 2018, les parties à la Convention sur la diversité biologique (CDB) ont adopté une décision sur les aires protégées et les autres mesures de conservation efficaces par zone (AMCE). Il donne la définition des AMCE ainsi que des avis scientifiques et techniques connexes, permettant d'élargir le champ d'action des autorités de gouvernance et des régions qui pourront être engagés et reconnus dans les efforts mondiaux de conservation. Les directives de nature volontaire des AMCE et les aires protégées, également incluses dans la décision, favorisent l'utilisation de modèles de gouvernance diversifiés, efficaces et équitables, l'intégration des aires protégées et des AMCE dans les paysages terrestres et marins plus larges, et l'intégration de la conservation de la biodiversité dans tous les secteurs. Pris dans leur ensemble, les conseils et les orientations volontaires clarifient davantage l'interprétation des parties à la CDB sur ce qui constitue des mesures de conservation par zone équitables et efficaces à l'intérieur et au-delà des aires protégées, et fournissent des critères normalisés permettant de mesurer et de rendre compte des attributs et de la performance des aires. Cette perspective politique suggère que la décision de la CDB représente une preuve supplémentaire de l'évolution du « nouveau paradigme des aires protégées » vers un « paradigme des aires conservées » plus large, qui incarne la bonne gouvernance, l'équité et des résultats de conservation efficaces, et comprend une diversité de contributions à la conservation tant à l'intérieur qu'au-delà des aires protégées.

SHORT COMMUNICATION: APPLICATION OF SITE-LEVEL ASSESSMENT OF GOVERNANCE AND EQUITY (SAGE) METHODOLOGY TO A CANDIDATE OECM: ANDAKÍ MUNICIPAL NATURAL PARK, CAQUETÁ, COLOMBIA.

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ABSTRACT

Governance is a fundamental aspect and precondition for conservation strategies, such as protected areas or OECMs. A methodology for Site-level Assessment of Governance and Equity (SAGE) has been proposed by IUCN to explore different aspects of governance, based on ten principles. This article describes the application of SAGE to a candidate OECM for what we believe is the first time: the Andakí Municipal Natural Park in the Amazon region of Colombia. The application of SAGE generated useful insights into different aspects of governance, including the importance of good communication and recognising and respecting the rights and responsibilities of different actors. Based on this experience, we believe that the SAGE methodology could be a useful tool not only to identify priorities for improving governance, but also to assess governance and equity in order to evaluate if an area meets the criteria for an OECM – that it is governed and managed to achieve sustained and effective contributions to in situ conservation of biodiversity, associated ecosystem functions and services, and cultural, spiritual, socio-economic and other locally relevant values.

Key words: governance, OECM, SAGE methodology, local government, conserved areas

This article describes the application of the Site-level Assessment of Governance and Equity (SAGE) methodology[1] to a candidate OECM (Other Effective Area-based Measure) for what we believe is the first time. The site is Andakí Municipal Natural Park (MNP) in the Amazon region of Colombia, which is a conservation area with shared governance between the local government and a non-governmental organisation, Fundación Tierra Viva.

Governance is a fundamental aspect and precondition for conservation strategies, such as protected areas or OECMs (Borrini-Feyerabend et al., 2014; Worboys et al., 2019; IUCN-WCPA Task Force on OECMs, 2019). Good governance is also crucial for effective and equitable conservation (Franks et al., 2018; IUCN-WCPA, 2019; Booker & Franks, 2019). Governance analysis allows the identification of several essential aspects including the guarantee of legitimacy and voice, transparency and accountability, and capacity to respond adaptively to meet conservation objectives (Booker et al., 2019).

In order to explore these governance aspects in detail, the SAGE methodology involves the assessment and application of a set of ten governance principles which are grouped into three dimensions of equity (recognition, procedure and distribution) plus a fourth grouping (see Table 1).

The SAGE methodology is an eight-step process, divided into two phases, which are followed by a third phase on

Table 1. Framework of equitable governance principles

Equity: Recognition:	Recognition and respect for the rights of all relevant actors
	Recognition and respect of all relevant actors and their knowledge
	Full and effective participation of all relevant actors in decision making
Equity: Procedure	Transparency, information sharing and accountability for actions and inactions
	Access to justice, including effective dispute resolution processes
	Effective and fair law enforcement
Equity: Distribution	Effective measures to mitigate negative impacts on communities
	Benefits equitably shared among relevant actors
Other	Achievement of conservation and other objectives
	Effective coordination and collaboration between actors, sectors and levels

'taking actions' that seeks to expand the impact of the evaluation through strategies and activity-planning (Booker et al., 2019) (see Figure 1).

The assessment phase (phase 2 of the methodology) is carried out using a multiple-choice questionnaire with questions about governance structure, procedure and outcomes for each of the ten principles. This set of questions is adapted as necessary to each site's context and answered in a participatory way with different stakeholders and rightsholders (step 2.2) before they come together in a synthesis workshop (step 2.3). Subsequently, with the answers to the questionnaire and the discussions in the synthesis workshop, an analysis of the data is carried out (step 2.4.). This provides pertinent information to actors in the area with which they can take decisions and plan actions to improve the governance of the site (phase 3: taking action).

In 2019, as part of a project on the application of OECM criteria to the Colombian context, the Andakí MNP and another 26 areas were assessed as potential OECMs using the IUCN Guidelines (IUCN-WCPA Task Force on OECMs, 2019). The results showed that in many cases there are governance aspects that could be enhanced in order for the areas to demonstrate that they had achieved a sustained and effective contribution to *in situ* conservation of biodiversity as required to be recognised and reported as an OECM.

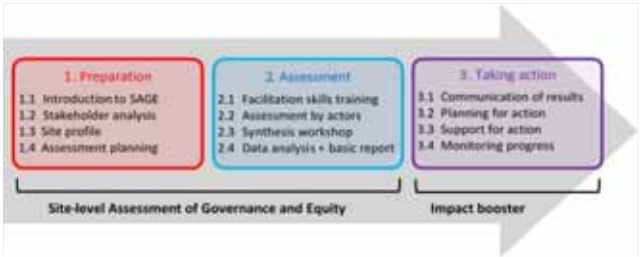


Figure 1. Phases of SAGE methodology

Andakí MNP was considered as a potential OECM because in Colombia local governments are not able to declare or manage protected areas. However, more than 140 local governments carry out ecological heritage conservation actions to guarantee the supply of ecosystem services as part of their territories' sustainable development (GIZ, 2019), and one type of local government action has been the creation and management of municipal conservation areas. Although these areas are not recognised in the National System of Protected Areas of Colombia (GIZ, 2019), they have a strong social function and in some cases are incorporated into land-use planning processes. These, then, are potential candidates for recognition as OECMs.

The Andakí MNP is in the municipality of Belén de los Andaquíes in the Colombian Amazon region, which has been conserving strategic areas for over 20 years in order to maintain their biodiversity. This conservation process actively involves local actors and has included the creation of nine municipal natural parks, including the Andakí MNP (Fundación Tierra Viva, 2013). The Andakí MNP covers an area of 26.7 km2 and was recognised by the local government based on its biodiversity, its ecosystem services and its important contributions to municipal development, as well as its role in maintaining sites of historical and cultural significance.

Due to the health emergency caused by SARS-CoV-2, the SAGE methodology was adapted to be applied not

only in the field but also remotely. For the preparation phase, a virtual training (step 1.1) on how to apply SAGE was developed by the EUROCLIMA+ Project and IIED with different Colombian institutions[2], together with SAGE developers, conservation practitioners and public institutions in Bolivia and Honduras[3]. The following steps were implemented through virtual meetings between the project team and on-site facilitators. As a result, the stakeholder and rightsholder groups (Indigenous peoples, rural communities, local and regional government, NGOs, academics and National Natural Parks of Colombia) were identified and participated in the assessment. The governance principles and related questions to be included in the assessment questionnaire were prioritised based on the content of the questions and their relevance to the context of the site, in line with the SAGE guidance, and adapted with input from on-site facilitators. As a result, eight principles where prioritised with a total of 17 questions. For the second phase, the assessments by each group of actors (step 2.2) were made through on-site and virtual assessment meetings with the support of local facilitators and the project team (Figure 2). Figure 3 shows the results of the evaluation by each group, with the mean scores for the eight governance and equity principles.

The final synthesis workshop was attended by two representatives of each of the four groups that participated in the assessment. During the workshops the results were shown and discussed, giving an opportunity for the participants to recognise each other's perspectives and needs.

The results of applying the SAGE methodology showed a high level of consensus between actors regarding the possibility of improvement on all evaluated governance principles, especially on dispute resolution, negative impacts and coordination-collaboration. The highest scored principle was 'respect for actors' which indicates that there was a high level of recognition and respect for the rightsholders and decision-makers involved in the governance and management of the Andakí MNP. This also implies that there was a strong sense of ownership of the conservation process and a high level of recognition of the legitimacy of the area. No striking differences between groups were evident. One important finding was related to principle 4 (on transparency, information sharing and accountability for actions and inactions), where there was a need to clarify actors' responsibilities and communication channels for conflict resolution.

The group approach allowed for substantial interaction between different organisations and groups of actors, which contributed to a good understanding of the issues and encouraged the input of all participants. The methodology also allowed different actors to articulate

Figure 2. SAGE assessment workshop

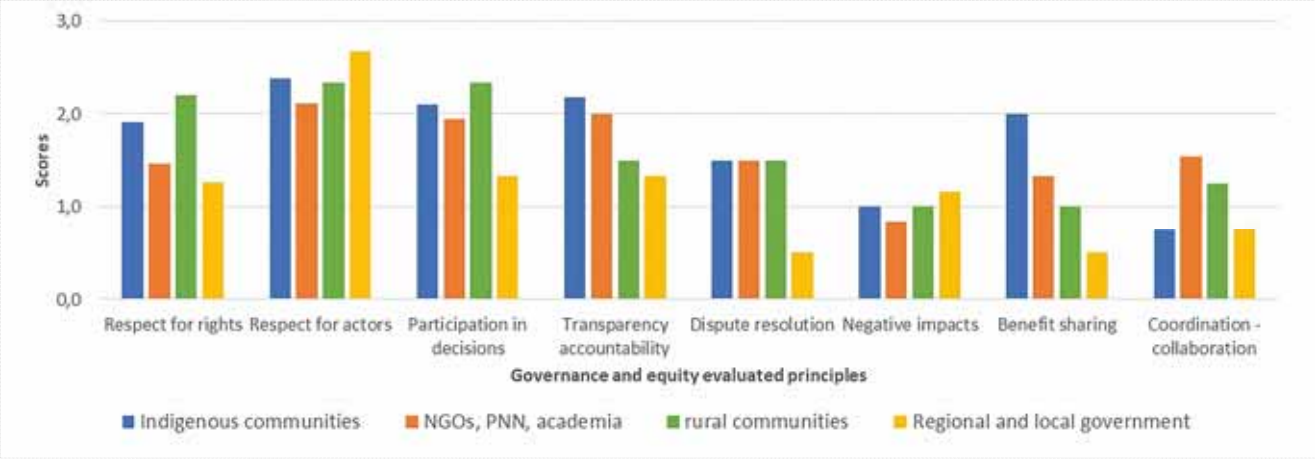


Figure 3. Mean scores for eight governance principles for each workshop group

their different ways of perceiving the territory (such as traditional, indigenous management or academic) in formulating their insights for a single purpose: to improve site governance and equity.

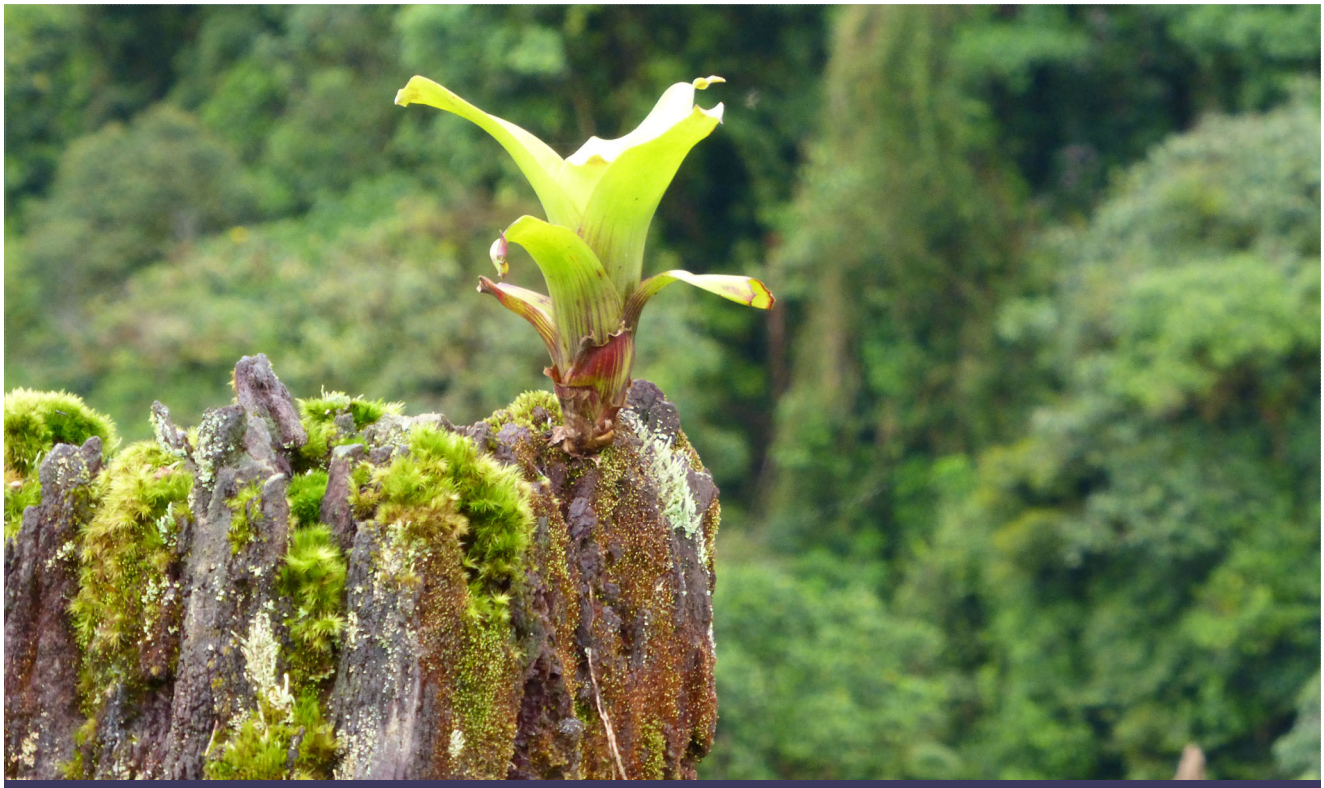
All stakeholders were willing to participate in future decision-making processes, conflict resolution and communication strategies, and the actions identified to improve governance will be considered for the Andakí MNP Management Plan update. The final phase of the methodology also generated insights on the role of Andakí MNP in terms of biodiversity conservation beyond its boundaries at a regional scale, involving connectivity with the Alto Fragua Indi Wasi National Natural Park (762.70 km2), and on possibilities for the coordination of conservation processes with actors from other areas and municipalities.

Overall, the methodology helped to generate relevant information about governance and management in relation to the OECM criteria at different levels. At the local level, as described above, it allowed the actors to identify the governance aspects that most need to be strengthened and to plan actions for better governance. Thus, applying SAGE in the Colombian context gave an opportunity to complement and strengthen existing governance arrangements for a candidate OECM and to plan for the implementation of management tools. At the national level, application of SAGE showed that many of the municipal conservation areas assessed fulfil most of the characteristics and criteria for OECM identification, although in some of them, governance arrangements and biodiversity monitoring need to be improved. This provides specific information that will help meet the national reporting requirements for OECMs and in turn will help the country to achieve its international obligations as a Party to the Convention on Biological Diversity (CBD).

The main practical lessons learned from applying the SAGE methodology were related to the essential role of local facilitators, the importance of verifying the ten governance principles, the process of prioritising questions for the site, and adapting the language (making it accessible to local facilitators and participants). A central aspect is the participation of all stakeholder groups throughout the whole assessment phase. Furthermore, although the methodology establishes that the principles and questions must be selected prior to the evaluation phase, we suggest reviewing them and making adjustments to the questionnaire with the facilitators on site. This ensures that prioritisation is aligned with local needs and interests.

In summary, the SAGE methodology did not require substantial modifications to its phases or steps in order to be applied to the Andakí Municipal Natural Park; it was successfully implemented as proposed in the international guidance. It quickly generated useful ideas for different aspects of governance, including good communication and recognising and respecting the rights and responsibilities of different actors. The process allowed weaknesses in the governance and management of the area to be identified and it made visible the need to strengthen coordination and information-sharing between the different actors. The process was also of great value in itself in working to strengthen shared governance and creating a space for future collaboration between the different actors involved.

Regarding the OECM criteria, the SAGE methodology could be a useful tool to assess governance and equity, helping to evaluate if the area meets the criteria of being governed and managed to achieve a sustained and



Bromelia Andakí Trail , Andaki Municipal Natural Park © José Alirio González Peréz

effective contribution to in situ conservation of biodiversity, associated ecosystem functions and services, and cultural, spiritual, socio-economic and other locally relevant values. The evaluation could highlight important aspects that need to be enhanced in the future to maintain these conditions in the long term. We suggest that the methodology should be tested in other potential and candidate OECMs in order to gain more insights into how it will help governments and other actors to apply the OECM criteria.

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ENDNOTES

[1]https://www.iied.org/site-level-assessment-governance-equity-sage

[2]Representatives of national and local governmental institutions and non-governmental institutions: Ministry of Environment and Sustainable Development, Alexander von Humboldt Institute, Fundación Tierra Viva, Embera Katio Indigenous group, Fundación Natura, Resnatur and Local Protected Areas Project.

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RESUMEN

La gobernanza es un aspecto fundamental y una condición previa para las estrategias de conservación, tales como las áreas protegidas o las OMEC (otras medidas efectivas de conservación basadas en áreas). La UICN ha propuesto una Evaluación de gobernanza y equidad a nivel de sitio (SAGE, por sus siglas en inglés) para explorar diferentes aspectos de la gobernanza, centrada en diez principios. Este artículo describe la aplicación de SAGE a un área con posibilidades de inclusión como OMEC: el Parque Natural Municipal Andakí en la región amazónica de Colombia. La aplicación de SAGE produjo reflexiones de gran utilidad sobre diferentes aspectos de la gobernanza, incluyendo la importancia de una buena comunicación y el reconocimiento y respeto de los derechos y responsabilidades de los diferentes actores. Con base en esta experiencia, creemos que la metodología SAGE podría ser una herramienta útil no solo para identificar prioridades para mejorar la gobernanza, sino también para evaluar la gobernanza y la equidad con el fin de determinar si un área reúne los criterios de OMEC –que se gobierna y gestiona con miras a lograr contribuciones sostenidas y efectivas para la conservación in situ de la biodiversidad, las funciones y servicios de los ecosistemas asociados, y los valores culturales, espirituales, socioeconómicos y otros valores localmente pertinentes.

RÉSUMÉ

La gouvernance est un aspect fondamental et une condition préalable aux stratégies de conservation, appliquée par les aires protégées ou les AMCE. Une méthodologie d'évaluation de la gouvernance et de l'équité au niveau sur le terrain (SAGE) a été proposée par l'UICN pour explorer différents aspects de la gouvernance, sur la base de dix principes. Cet article décrit l'application de SAGE pour la première fois, à notre connaissance, à un candidat AMCE : le Parc Naturel Municipal d'Andakí dans la région amazonienne de la Colombie. L'application de SAGE a fourni des indications utiles sur différents aspects de la gouvernance, y compris l'importance d'une bonne communication, de la reconnaissance et du respect des droits et des responsabilités parmi les différents acteurs. Sur la base de cette expérience, nous pensons que la méthodologie SAGE pourrait être un outil utile non seulement pour identifier les priorités pour améliorer la gouvernance, mais aussi pour examiner la gouvernance et l'équité afin d'évaluer si une zone répond aux critères d'une AMCE – à savoir qu'elle soit régie et gérée de manière à apporter des contributions durables et efficaces à la conservation de la biodiversité in situ, des fonctions et des services écosystémiques associés, ainsi que des principes culturels, spirituels, socio-économiques et autres valeurs pertinentes à l'échelle locale.