



Strengthening the global system of protected areas post-2020: A perspective from the IUCN World Commission on Protected Areas

Kathy MacKinnon, *IUCN World Commission on Protected Areas*
Risa Smith, *IUCN World Commission on Protected Areas*
Nigel Dudley, *IUCN World Commission on Protected Areas / Equilibrium Research*
Penelope Figgis, *IUCN World Commission on Protected Areas*
Marc Hockings, *IUCN World Commission on Protected Areas / University of Queensland*
Karen Keenleyside, *IUCN World Commission on Protected Areas / Parks Canada*
Dan Laffoley, *IUCN World Commission on Protected Areas*
Harvey Locke, *IUCN World Commission on Protected Areas*
Trevor Sandwith, *IUCN Global Protected Areas Programme*
Stephen Woodley, *IUCN World Commission on Protected Areas*
Mike Wong, *IUCN World Commission on Protected Areas*

Corresponding author

Mike Wong
845 Des Saisons
Gatineau, Québec J9J 3B9
Canada
Mike.WONG@iucn.org

Abstract

Protected areas are the cornerstones of biodiversity conservation and have never been more relevant than at the present time when the world is facing both a biodiversity and a climate change crisis. The International Union for Conservation of Nature (IUCN) World Commission on Protected Areas (WCPA) has been helping to set global standards and best practice guidelines in protected area planning and management for 60 years. Following this guidance, many countries have made significant progress toward their Aichi Target 11 commitments under the Convention on Biological Diversity (CBD). The global community will be coming together at the 15th Conference of the Parties of the CBD to set new biodiversity conservation targets for the next decade, as milestones to 2050 and a vision of “a world living in harmony with nature.” This paper lays out the WCPA perspective on priorities for supporting effective protected and conserved areas for the post-2020 era.

Keywords

Protected areas, conservation targets, post-2020 Global Biodiversity Framework, climate change, sustainable development goals (SDGs)

Introduction

Over time, the reasons for establishing protected areas have gradually evolved. Initially, national parks such as Yellowstone (established 1872) were set up to prevent damage to iconic, highly scenic landscapes. As the concept spread, more attention was given to maintaining populations of particular endangered species such as gorillas, rhinos, and tigers, and from the 1980s, protected areas often had a more general focus on biodiversity and ecosystems (Watson et al. 2014). There is now increased global understanding that modern-day conservation and the well-being of people require

areas of the land and sea to be free of industrial-scale production and extraction and maintained in a natural state for species habitat and healthy ecological systems. These areas often have profound cultural importance and support livelihoods of traditional peoples. These are the world’s protected areas. Many of the great natural icons of the earth are protected areas—among them Yellowstone and Yosemite (USA), the Galapagos Islands (Ecuador), Uluru Kata Tjuta (Australia), the Serengeti (Tanzania), New Zealand Fiordland, Sagarmatha (Nepal), Iguazu (Argentina/Brazil), and China’s



The immense rock formation, of special cultural significance to the Anangu people, of Uluru-Kata Tjuta National Park and UNESCO World Heritage Site, located in Northern Territory, Australia.



A US National Park Service wildlife biologist examining the skull of a wolf-killed elk in Yellowstone National Park, USA. The park was established in 1872.

panda reserves. They are the great treasures of every nation and often provide the backdrop for rural livelihoods and tourism industries.

Recognizing the importance of all forms of protected areas in safeguarding biodiversity and livelihoods, in 1960 the International Union for the Conservation of Nature (IUCN) created a permanent Commission on National Parks and Protected Areas; this later evolved to become IUCN's World Commission on Protected Areas (WCPA). Celebrating its 60th anniversary in 2020, WCPA has developed into the world's premier network of protected areas experts and managers, with more than 3,000 members from over 140 countries and 26 specialist groups and task forces (see <https://www.iucn.org/commissions/world-commission-protected-areas>). Over the years, WCPA has focused on capacity building and collating and disseminating best practice guidance on a range of topics from governance models and management to connectivity and restoration, tourism and freshwater habitats, World Heritage and adapting to climate change.

Since the first meeting in Seattle, USA, in 1962, and at ten-year intervals, WCPA has organized an IUCN

World Parks Congress. The 6th Congress, held in Sydney, Australia, in 2014, entitled *Parks, People, Planet*, emphasized the contribution that parks and other conservation areas can make not just to biodiversity conservation but also to human welfare and well-being, providing natural solutions to climate change and other global challenges. These congresses have helped to lay out protected area agendas for the next decade.

Since its establishment 60 years ago, WCPA has been involved in setting global standards for protected areas planning and management and, more recently, in emphasizing their key role in delivering livelihood, economic, cultural, and social benefits linked to their primary goal of conserving nature (Dudley et al. 2010).

The commission has also played a key role in helping to provide input and support on area-based conservation policies to the United Nations' Convention on Biological Diversity (CBD) with protected areas as a central theme of the convention's work. In 2004, the CBD adopted a detailed Programme of Work on Protected Areas largely based on the recommendations from the 5th IUCN World Parks Congress in Durban, South Africa. In 2010, the CBD adopted a Strategic Biodiver-



The 2019 meeting of the WCPA Steering Committee in Amboseli National Park, Kenya.

sity Framework with 20 Aichi Targets (so named for the prefecture in Japan in which they were adopted) for the period 2011–2020. Aichi Target 11 sets out goals for protected and conserved areas in terrestrial, marine and freshwater ecosystems (see Box 1).

This article briefly reviews progress on implementation of Aichi Target 11 and then sets out some key components for effective area-based conservation in the post-2020 Biodiversity Framework.

Delivering Aichi Target 11

Target 11 has been one of the most successful of the Aichi Targets, with many countries making good progress in expanding protected area coverage, although other criteria and quality aspects of the target, including governance and quality of management, have been less successful (Gannon et al. 2019). Much still needs to be done to make sure that existing protected areas are effective in delivering biodiversity outcomes, including better ecological representation within conservation networks (Woodley et al. 2012). Target 11 includes both protected areas and “other effective area-based conservation measures” (OECMs) as means of conserving biodiversity *in situ*. As the definition of OECMs was only adopted in November 2018 (Convention on Biological Diversity 2018), there is limited information on the global extent of OECMs or their contribution to ecological representation or coverage of important biodiversity areas. Nevertheless, it is likely that the status of several elements of Target 11 will improve substantially as reporting on OECMs advances (Jonas et al. 2018).

According to the World Database on Protected Areas (WDPA), as of September 2019, terrestrial protected area coverage had reached 15.0% (Gannon et al. 2019). Marine protected area coverage for the global ocean was 7.8%, while coverage is 18.1% for areas under national jurisdiction (national waters) and 1.2% for areas beyond national jurisdiction (UNEP-WCMC et al. 2019). These figures represent a modest increase in reported terrestrial protected area coverage over the period since 2010, and a substantial increase in marine coverage, due to establishment of some very large marine protected areas (MPAs) in recent years (Gannon et al. 2019) and large-scale networks developed by some countries such as Australia (Fitzsimons and Wescott 2018). Currently, the 20 largest marine sites now account for almost two-thirds of total global marine coverage (UNEP-WCMC et al. 2019).

While there has been good progress in increasing protected area coverage, the real impact of these reserves

Box 1

Aichi Target 11

By 2020, at least 17% of terrestrial and inland water, and 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

over time will depend on improving governance and management effectiveness and other quality elements included in Aichi Target 11 (Gannon et al. 2019). With regard to ecological representation, for instance, by January 2019 protected area coverage was at least 17% for 344 out of 823 terrestrial ecoregions, while 102 had less than 2% coverage. For the marine realm, 109 out of 232 marine ecoregions, and four out of 37 pelagic provinces had reached 10% coverage, while 66 marine ecoregions and 13 pelagic provinces had less than 2% coverage by reported protected areas. Currently 21 terrestrial ecoregions, eight marine ecoregions, and four pelagic provinces have no reported protected areas (JRC 2019). While there is good representation of some habitats such as mountain ecosystems, other more accessible and threatened ecosystems such as lowland rainforests and wetlands are less well represented in national and global networks. Similarly, considering important biodiversity areas globally, mean per cent coverage of Key Biodiversity Areas (KBAs) is 46.1% for terrestrial sites and 45.7% for marine sites, with 19% of terrestrial KBAs fully covered by reported protected areas and over 33% having no coverage (Gannon et al. 2019). Increased recognition and reporting of OECMs will further increase levels of ecological representation and coverage in KBAs. Analysis of 740 terrestrial KBAs in 10 countries found that 76% of those containing no protected areas were at least partly covered by potential OECMs (Donald et al. 2019).

Lessons from implementation of Aichi Target 11

Experience with applying Target 11 has provided some valuable lessons. The percentage targets have been useful in driving protected area expansion in many nations, but are not adequate by themselves to fully conserve biodiversity.

The CBD adoption of criteria on OECMs in 2018 provides a great opportunity to focus on areas where

current governance and management is already contributing to effective *in situ* conservation of intact ecosystems such as some Indigenous and Community Conserved Areas (ICCAs) and Locally Managed Marine Areas (LMMAs). Recognizing, reporting on, and supporting these areas will not only add to overall totals of conservation areas but will also contribute to more diverse governance and better ecological representation. Ideally, going forward there would be one future target for effective area-based conservation, focusing on protected areas and OECMs, with subtargets for both categories.

Therefore, post-2020 any successor to Target 11 needs to include:

- Expanding protected area coverage in terrestrial, freshwater, and marine habitats, with a strong emphasis on greater ecological representation.
- Improving the quality and effective management of all conservation areas to ensure strong biodiversity outcomes.
- Increasing the recognition and support of all governance models that achieve effective and equitable conservation outcomes, including privately protected areas and ICCAs.
- Strengthening the identification and protection of areas of importance for biodiversity such as KBAs and Ecologically or Biologically Significant Areas (EBSAs).
- Setting a specific goal for conservation of large, intact wilderness areas to protect remaining areas of wild nature while recognizing the interests of Indigenous traditional owners.
- Integrating biodiversity strategies with both climate mitigation and adaptation strategies, recognizing that protected areas can provide nature-based solutions to climate change.
- Complementing core area-based conservation targets with additional targets on ecological connectivity, ecological restoration, and better spatial planning.
- Identifying measures to integrate more biodiversity-friendly practices into production sectors that operate around protected areas, such as forestry, fisheries, and agriculture.

The following section sets out in more detail key areas that WCPA believes are essential to ensure protected and conserved areas become an increasingly effective instrument in addressing the major environmental challenges of our age: species survival, biodiversity conservation, climate change, and global sustainability.

Setting new area-based conservation targets for 2020 and beyond

The world is facing a global biodiversity crisis. Extinction rates are estimated to be 1,000 times the background rate and future rates could be 10,000 times higher (De Vos et al. 2015). The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) reports that 75% of Earth's land surface is significantly altered, 66% of the ocean area is experiencing increasing cumulative impacts, and over 85% of wetlands (by area) have been lost (Diaz et al. 2019). Average population sizes of wild vertebrate species have declined precipitously over the last 50 years on land, in freshwater, and in the sea, and around 25% of species in assessed animal and plant groups are threatened with extinction (Diaz et al. 2019). The most significant direct drivers of biodiversity loss are habitat loss and fragmentation (changes in land and sea use) and direct exploitation, with over-exploitation being more significant in marine systems. Climate change, invasive alien species, disease and, pollution are also important factors (Diaz et al. 2019), particularly so in the ocean where increasingly strong impacts are now being seen from acidification, warming, (Laffoley and Baxter 2016) and deoxygenation (Laffoley and Baxter 2019). Many of these drivers of biodiversity loss can be managed through area-based conservation, with protected areas and OECMs helping to reduce and reverse habitat loss, fragmentation, and over-harvesting.

To conserve biodiversity, protected and conserved areas need to be selectively located, ecologically representative, well governed, and effectively and equitably managed (Woodley et al. 2012). Setting global priorities for where biodiversity should be conserved is complementary to the question of how much area of land and sea should be conserved. Area-based targets should include both biodiversity targets and nature's contributions to sustaining people through ecosystem services, including carbon storage, water security, and reducing disaster risk (Woodley et al. 2019). In some regions it may be possible to establish protected areas which overlap areas of importance for biodiversity that are also important carbon stores (Dinerstein et al. 2019).

New targets for effective conservation areas should be established based on the desired outcomes to achieve secure natural ecosystems (e.g., halting biodiversity loss by 2030). There is good scientific support for a minimum target ranging from 30% to 70%, or even higher, of the land and sea (Woodley et al. 2019). A target of at least 30% is consistent with IUCN policy statements in the Promise of Sydney, the policy docu-

ment emanating from the 6th World Parks Congress, as well as Resolution WCC-2016-Res-050 of the 2016 World Conservation Congress, which calls for at least 30% of the marine realm to be protected. Implementation of large global percentage area targets can be achieved through differentiating the kinds of areas that need protection at a national scale, supported by nationally determined contributions in accordance with local conditions. Canada, for example, has now formally committed to conserving 25% of land and oceans by 2025 and 30% by 2030.

A key implementation challenge is that many parts of the terrestrial world are already too developed and modified to be considered as contributors to such targets. Accordingly, a WCPA task force has developed an enabling framework that would implement local conservation objectives once a global percentage target is set. The three global conditions for biodiversity conservation and sustainable use are Cities and Farms, Shared Lands, and Large Wild Areas, each with differ-

ent policy and management objectives (Locke et al. 2019).

- **Cities and Farms.** Secure endangered species, protect all remaining primary ecosystem fragments, maintain pollinators, and increase ecological restoration. Mainstream sustainable practices such as nitrogen use reduction and planning for compact cities that protect good farmland and provide access to nature for urban dwellers' health and well-being.
- **Shared Lands.** Establish “ecologically representative and well-connected systems of protected areas ... integrated into the wider landscape” (from Aichi Target 11); restore and maintain ecological processes and viable populations of native species (increase the area protected and conserved to 25–75% of each ecoregion). Practice sustainable resource use outside protected areas, but integrated with well-managed and properly funded protected area networks and sustainable tourism. Local



Visitors at SGaang Gwaii World Heritage Site of Gwaii Haanas National Park Reserve and Haida Heritage Site of British Columbia, Canada.

livelihoods may include use of wildlife and natural resources where appropriate and sustainable.

- **Large Wild Areas.** Retain overall ecological integrity and associated global processes such as carbon storage and rainfall generation, fluvial flows, and large migrations; prevent further fragmentation, allowing only rare nodes of intense industrial development enveloped in a largely wild matrix. Control invasive species as needed. Secure Indigenous knowledge and livelihoods.

Intended to be carried out simultaneously, these conservation responses and sustainable practices offer a coherent basis for common national actions and international cooperation to protect the “Earth ecosystem” (Woodley et al. 2019).

Transforming the conservation landscape: Recognizing and reporting on OECMs

In 2018, CBD adopted voluntary guidance that unified approaches to governance involving protected

areas and “other effective area-based conservation measures” (OECMs), and elaborated principles and guidance for governance and equity, ensuring that all dimensions could be considered in processes of assessment and evaluation (Convention on Biological Diversity 2018). Nevertheless, the element of Target 11 focused on equitable governance remains poorly implemented in practice, and will not be achieved substantially by 2020. This makes it even more critical that the standards, tools, methods, and guidance that have been developed are given further incentives in the post-2020 Biodiversity Framework since good governance has been shown to be a key criterion for effective conservation.

The adoption of a definition and criteria for OECMs is likely to be a game changer for area-based conservation, enabling recognition of a wide range of *de facto* conservation efforts outside the currently designated protected areas network (CBD 2018). Whereas protected areas should have conservation as their primary



The intertidal zone of the Gwaii Haanas National Marine Conservation Area, which was established in 2010. The national park and marine conservation area are managed cooperatively, from mountaintop to seabed, by the Government of Canada and the Haida Nation.

objective, OECMs deliver effective long-term conservation regardless of their management objectives (IUCN WCPA 2019). Some OECMs may indeed have a conservation objective (either primary or secondary) but others may simply deliver ancillary conservation, such as historic shipwreck sites, such as Scapa Flow in Scotland, which are fully protected as war graves and incidentally provide undisturbed environments for diverse marine wildlife. Like protected areas, OECMs can include the full range of governance types and may be managed by Indigenous peoples and local communities, a private-sector entity, or even government agencies, or any combination of these.

In terms of delivering biodiversity outcomes, OECMs can be regarded as complementary to protected areas. OECMs can contribute to the conservation of biodiversity in many ways, such as: conserving important ecosystems, habitats, and wildlife corridors; supporting the recovery of threatened species; maintaining ecosystem functions and securing ecosystem services; enhancing resilience against threats; and retaining and connecting remnants of fragmented ecosystems within developed landscapes (see Box 2). OECMs can also contribute to ecologically representative and well-connected conservation systems, integrated within wider landscapes and seascapes. In doing so, they can be a valuable contribution to a more ambitious global target of at least 30%. Like protected areas, many potential OECMs may also be delivering ecosystem services; for example, an Indigenous or community-managed conservation area in a watershed protecting high-biodiversity forests and water supplies.

In the post-2020 Biodiversity Framework, much greater attention must be paid to ensuring that both protected areas and OECMs are delivering their full potential to maintain biodiversity outcomes. With regard to OECMs, it will be important to understand why they currently deliver effective conservation and what support, if any, the governance and management authorities need to maintain those biodiversity outcomes.

Protected areas are a proven conservation tool and the conditions for their effective management are well documented (Barnes et al. 2016; Gill et al. 2017; Geldmann et al. 2018). OECMs, on the other hand, are a new concept at the international level and will represent a novel national-to-local form of legal recognition. Maintaining the full value of OECMs is likely to require substantial efforts to build capacity to identify, monitor, and maintain their biodiversity values. OECMs provide an exciting opportunity to expand the conservation estate but all potential sites must be screened carefully

Box 2 OECMs protecting biodiversity, increasing ecological representation

To be considered an OECM, the area in question must effectively protect one or more of the following elements of native biodiversity:

- Rare, threatened, or endangered species and habitats, and the ecosystems that support them, including species and sites identified on the IUCN Red List of Threatened Species, Red List of Ecosystems, or national equivalents.
- Representative natural ecosystems.
- High levels of ecological integrity or ecological intactness, which are characterized by the occurrence of the full range of native species and supporting ecological processes. These areas will be intact or be capable of being restored under the proposed management regime.
- Range-restricted species and ecosystems in natural settings.
- Important species aggregations, including during migration or spawning.
- Ecosystems especially important for species life stages, feeding, resting, molting, and breeding.
- Areas that are important for ecological connectivity or to complete a conservation network within a landscape or seascape.
- Areas that provide critical ecosystem services, such as clean water and carbon storage, in addition to *in situ* biodiversity conservation.
- Species and habitats that are important for traditional human uses, such as native medicinal practices.

In this context, an intensively managed farm with a small proportion of the original native plants and birds will likely not be an OECM. Conversely, an area of native grassland, dominated by native plants, and having healthy populations of a large variety of native birds and mammals, might well be an OECM if a lower-intensity management and governance regime ensures these biodiversity conservation outcomes over the long term. As with protected areas, there may be instances where an OECM is especially important for protecting a particular threatened species by virtue of its protecting an entire ecosystem.

Source: IUCN-WCPA 2019

to avoid any tendency to inflate conservation totals by counting as OECMs areas that do not meet the criteria, including those associated with industrial forestry and fishing; such areas would be better mapped to other CBD targets focused on sustainable use (Laffoley et al. 2017).

Areas likely to qualify as potential OECMs may include: some ICCAs; some areas in production landscapes managed for conservation rather than exploitation, such as ecosystem restoration forests in Indonesia (Utomo and Walsh 2018); some watershed protection areas for cities; some community pastures with native prairie; some sections of military reserves with access restrictions and conservation goals and management; and some marine areas protected for reasons other than conservation, such as historic shipwreck sites. Conservation measures that are unlikely to qualify as OECMs include: areas where temporary fishing closures are in place only until an overfished area recovers; urban parks and other formal gardens; heavily grazed grassland or grassland replanted with monocultures or non-native species for livestock; large landscape- or seascape-scale management policies targeting a limited number of biodiversity elements, such as fishing or hunting restrictions on individual species; and production forests managed for logging even though they may have some biodiversity values. WCPA has provided technical guidance on recognizing and reporting on OECMs, including a simple screening tool and some examples of potential OECMs (IUCN-WCPA 2019).

Improving the quality of protected and conserved areas

WCPA has long recognized that protected areas must be well designed and equitably and effectively managed if they are to deliver their full benefits to nature and human society. Good governance is required to ensure that rights and responsibilities are recognized and costs and benefits are appropriately shared (Borrini-Feyerabend et al. 2013). WCPA recognizes that protected and conserved areas can include a range of governance and management regimes. Over the last 10 years there has been an encouraging increase in privately protected areas although many are still not recognized as protected areas by national governments (Stolton et al. 2014; Bingham et al. 2017).

Assessing and improving effective management has been an element of protected area targets since the development of the CBD Programme of Work on Protected Areas in 2004, and Aichi Target 11 asserted a new goal to achieve the “equitable management” of systems of protected areas and OECMs (Convention on Biolog-

ical Diversity 2011). Although conflating the concepts of governance and management, Target 11 asserted the mutual interdependence of biodiversity and social outcomes and the means to achieve them. Further efforts have been made across the WCPA practitioner network to elaborate guidance on how to apply governance principles and types in practice in a variety of contexts, including transboundary governance, privately protected areas, and conservation of sacred natural sites (Wild and McLeod 2008; Vasilijević et al. 2015; Mitchell et al. 2018).

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 is arranged under four components—Good Governance, Sound Design and Planning, and Effective Management, all of which lead to Successful Conservation Outcomes—divided into 17 criteria and 50 indicators. IUCN manages the Green List through a certification process that examines evidence against each of the criteria and indicators, assessed by an independent group of experts and overseen by an independent reviewer to ensure that proper processes and appropriate evidence are used in the assessment. The IUCN Green List program is currently operating in over 40 countries, and by December 2019, 46 sites in 14 countries had been awarded Green List status with hundreds of others engaged in the process.

Ecological restoration and connectivity

Ecological restoration is an increasingly important management tool for halting and reversing ecosystem degradation and likely to get more attention over the next decade as part of the UN Decade on Ecosystem Restoration. It contributes to global conservation objectives by reducing biodiversity loss, enhancing natural capital and ecosystem services, enhancing landscape connectivity, facilitating mitigation and adaptation to the adverse effects of climate change, and contributing to the improvement of human well-being. Ecological restoration is likely to become a more common and necessary conservation tool in the future, both within degraded sections of protected areas and to re-establish and maintain wildlife corridors between protected areas and/or fragmented habitats. The new post-2020 Biodiversity Framework may well have a standalone target for restoration. With regard to effective conservation areas, it will be important to focus on ecosystems of high biodiversity value, as well as those, such as wetlands and other threatened habitats, that are currently poorly represented in global protected area networks. Any restoration efforts should

reduce the threats that caused the original degradation and biodiversity loss, and focus on connectivity to strengthen protected area networks (Woodley et al. 2019). Areas with active or proposed restoration efforts should not be recognized as OECMs unless and until they are delivering biodiversity benefits (IUCN-WCPA 2019).

Even in a world where at least 30% of natural habitats are conserved in effectively managed protected areas and OECMs, there will still be a need for more sustainable management on land- and seascapes and for measures to enhance connectivity between conserved areas (Hilty et al. 2020). This will become especially important as species distributions and movements change as an adaptation to climate change. Dinerstein et al. (2019) call for a new global deal for nature where 30% of the planet is protected in well-located and -connected systems of protected areas, and an additional 20% is focused on conserving ecosystems of high carbon storage value. This combined approach aims to tackle threats to nature from climate change and mass extinction. With significant and accelerating impacts from climate change in polar, temperate, and tropical ocean regions, there is a strong case that a new global deal for nature should also include an additional 20% of the marine realm under climate-sensitive management (D. Laffoley, pers. comm.; Dinerstein et al. 2019). Such efforts must be linked to enhanced sustainable management of surrounding land- and seascapes (Woodley et al. 2019).

Addressing climate change through protected areas

By 2010, WCPA recognized the profound role that nature conservation and protected areas could play in addressing climate change (Dudley et al. 2010). Subsequently evidence has mounted that the climate crisis and the biodiversity crisis are so intricately entwined that neither can be effectively addressed without attention to the other (IPCC 2018; Diaz et al. 2019; Smith et al. 2019). The urgency of addressing these twin crises in the next 10 years calls for an increased focus on the role of protected areas, not only as places to conserve biodiversity, but to maintain natural carbon sinks and stores (Rockström et al. 2017; Dinerstein et al. 2019). Conservation of carbon-rich 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).

Under most scenarios, climate change will become an increasingly important direct driver of changes to bio-

diversity. IPBES recommends expanding and strengthening ecologically representative, well-connected protected area networks and OECMs as one of just a few policies that can address the challenges of biodiversity loss and climate change simultaneously (Diaz et al. 2019). Protected areas have been estimated to store about 15.2% of terrestrial carbon stocks and to capture about 20% of the carbon sequestered annually by all land ecosystems (Melillo et al. 2016). The carbon stored in coastal and marine protected areas is also believed to be significant, although it has not yet been quantified. Oceans have absorbed 20–25% of atmospheric carbon dioxide since 2008 (Le Quéré et al. 2018), and blue carbon—that stored in mangroves, tidal marshes, and seagrass meadows—represents half of the carbon stored in marine sediments (Duarte et al. 2013; Blue Carbon Initiative 2017).

From a climate crisis perspective, goals to increase the coverage of protected areas should prioritize carbon-rich ecosystems, such as primary forests (Körner 2017), blue-carbon ecosystems, peatlands, and native grasslands. These ecosystems are being lost at an alarming rate. For example, since 2014 the average annual loss of humid tropical primary forest has accelerated by 44% compared with the 2002 baseline period (NYDF Assessment Partners 2019). The situation in marine systems is equally alarming. Between 2002 and 2012, 22% of the area of global mangroves was lost (Herr and Landis 2016). As carbon-rich ecosystems often also support rich biodiversity, these approaches have cobenefits for biodiversity protection (Dinerstein et al. 2019).

Because the remaining large tracts of intact carbon-rich ecosystems are not evenly distributed around the world, some places will require a higher percentage of new protected areas than others. These particularly important areas include the Amazon Basin, Congo Basin, Southeast Asia, and boreal and tundra areas (Dinerstein et al. 2019). Large, intact blue-carbon ecosystems are found in every region except the Antarctic (Giri et al. 2011). Economic tools—such as payment for ecosystem services, REDD+ (the United Nations' program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries), or some kind of compensatory funding—may be needed as incentives to some regions to protect their ecosystems for the global good.

Thirty-seven percent 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% of all carbon stored in terrestrial ecosystems and make up about 40% of the total area that is formally protected (Garnett et al. 2018; Diaz et al. 2019). 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 the communities themselves (Colchester 2004; Dinerstein et al. 2019).

Protected areas contributing to delivery of the UN Rio Conventions

Beyond the CBD, protected areas make substantial contributions to realizing commitments under the other two so-called UN Rio Conventions: the United Nations Framework Convention on Climate Change (UNFCCC) and the UN Convention to Combat Desertification (UNCCD). Revisions to nationally determined contributions (NDCs) to the Paris Agreement of the UNFCCC 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. Currently 12% of countries include the carbon sequestration benefits that protected areas can provide as part of their NDC, and 18% explicitly mention adding new protected areas or expanding existing ones (Hehmeyer et al. 2019). For the first time, natural climate solutions, including enhanced protection of areas important for climate change mitigation and adaptation, was a central theme at the 25th meeting of the UNFCCC Conference of the Parties in Madrid in 2019. The High Ambition Coalition for Nature and People (HAC), whose objectives include effective protection of 30% of Earth's natural spaces by 2030, was expanded to 20 countries in Madrid (Campaign for Nature 2019; Pelegri 2019) and many more indicated their intention to join.

Similarly, the UNCCD has a land degradation neutrality target, which aims to halt and reverse the current catastrophic rate of land degradation. Protected areas have a key role to play here as well. Strategically located areas of strict protection can help to slow desertification by maintaining or recovering dryland vegetation to stabilize slopes and reduce the impacts of wind or water erosion (Dudley et al. 2014). More generally, protected landscapes, IUCN protected area management Category V, provide a means for integrating biodiversity conservation with farming practices, particularly livestock rearing, thus providing both livelihood options for local communities and helping to reduce overall ecosystem degradation.

Protected areas and the UN Sustainable Development Goals

Since the turn of the century, there has been increased understanding and emphasis on the role that protected areas can play in provision of a variety of other ecosystem services, ranging from contributions to food and water security to various forms of disaster risk reduction, climate change mitigation and adaptation, and the support of a wide variety of cultural, recreational, and spiritual values (Stolton and Dudley 2010).

When the 2030 Sustainable Development Goals (SDGs) were agreed to by the United Nations in 2015, the potential contribution of area-based conservation was quickly recognized by WCPA (Dudley et al. 2017). Dedicated SDG targets for life below water (SDG14) and life on land (SDG15) have been deliberately modeled on the CBD's Aichi biodiversity targets, with protected areas and OECMs playing a key role in delivery. It is also increasingly acknowledged that well-managed areas under different protection and conservation regimes can also contribute to many other SDGs, including helping people to cope with climate change (SDG 13) (Dudley et al. 2010). Protected areas help deliver food security (SDG2) by protecting crop wild relatives for breeding or by acting as breeding grounds and replenishment sites for marine fisheries (Halpern 2003; E. Sala, pers. comm.). Similarly, many cities rely on protected forests and wetlands for their drinking water (SDG6), with natural ecosystems providing cleaner water and, in cases such as tropical montane cloud forests, also increasing water flow. The money that national parks and other protected areas can generate for rural communities helps to support livelihoods and address poverty reduction (SDG1) and, if properly managed, reduce inequalities (SDG10). Protected areas provide a wide assortment of health benefits, by maintaining vital supplies of both local medicines and the genetic material used to develop pharmaceuticals (SDG3). Protected areas offer many other proven health benefits, including opportunities for physical activity and improved mental health, with economic valuations showing that access to nature can save billions of dollars in expenditures for health services (MacKinnon et al. 2019).

National parks and nature reserves inside or close to city boundaries provide vital breathing space for their inhabitants as well as providing high-quality water supplies for more sustainable cities (SDG11). Indeed, many cities are launching programs to enhance the health benefits of parks based on a model of Healthy Parks, Healthy People first established by Parks Victoria in

Australia (MacKinnon et al. 2019). Finally, initiatives such as transboundary peace parks are ways in which communities can come together and build understanding (SDG16) and cooperation after the cessation of conflicts (Stolton and Dudley 2010).

Beyond the science: Inspiring a new generation with #NatureForAll

Over a decade ago, Louv (2005) highlighted the disconnect of the new generation of children to the natural world. A considerable body of evidence now exists identifying barriers to experiencing and connecting with nature in modern society, including fear of the outdoors, shortage of resources to participate in nature-based activities, and lack of access to nature due to urbanization (Children and Nature Network and #NatureforAll 2018). To reverse these trends and to make nature a part of the lives of all people from all walks of life, WCPA and the IUCN Commission on Education and Communication jointly launched the #NatureForAll movement in 2016. #NatureForAll is a movement of organizations and individuals around the world promoting ways to inspire love of nature and to overcome barriers for connecting to it. Partners repre-

senting health care, education, museums, zoos, botanical gardens, aquaria, youth, tourism, technology, and more are inspiring action. Key strategies for connecting people to nature include:

- Bringing children into nature at an early age.
- Finding and sharing the fun in nature.
- Using urban gateways to nature.
- Embracing technology for connection.
- Sharing cultural roots and ancestry in nature.
- Seeking out diverse partnerships.
- Empowering a new generation of leaders.

These key strategies, including examples of best practices for connecting people with nature from around the world, have been reviewed in the *#NatureForAll Playbook* (#NatureForAll 2017). As the world is confronted with growing biodiversity and climate change challenges, there is a critical need to inspire young people, conservation organizations, and corporate and social leaders in order to support a new generation's stewardship of nature. Parks and protected areas, given their global distribution and stimulating conservation efforts, are well situated to implement many of these



Visitors exploring the glaciers of Sirmilik National Park located in the Qikiqtaaluk Region of Nunavut, Canada. The park was officially established in 2001 and is cooperatively managed with the Inuit of the region.

strategies. For example, the iNaturalist mobile phone application employs artificial intelligence technology to help identify plant and animal images to the species level (Nugent 2018) and has been employed in visitors' programs in the national parks of Canada (Parks Canada 2018).

This movement is connected to the growing understanding that parks and protected areas are essential “infrastructure” for both physical and mental health and well-being, among other social benefits (MacKinnon et al. 2019). As the world continues its path of urbanization, this role for protected areas will grow in importance and many countries are now looking to create and support urban protected areas (Trzyzna 2014). Urban protected areas such as The Rouge National Urban Park (Toronto, Canada) and Barnes Wetlands (London) are not just refuges for wildlife but are valuable resources for recreation, relaxation, and healthy exercise. Many urban protected areas also provide valuable green infrastructure contributing to flood abatement, cleaner air, and other ecosystem services vital to human welfare.

Looking forward

Biodiversity loss, climate change, and water shortages will be some of the greatest challenges of the next decades. Well-managed protected and conserved areas, guided by WCPA's global standards, are effective tools for halting and reversing biodiversity loss and are proven natural solutions to help societies cope with, mitigate, and adapt to climate change. The important role that protected and conserved areas can play in addressing both the biodiversity and climate change crises has led to a concerted call for more ambitious targets for area-based conservation post-2020, with protection of at least 30% of the terrestrial and marine realms and more sustainable management of surrounding production landscapes and waters (Dinerstein et al. 2019; Woodley et al. 2019). Gathering the necessary political support for such ambitions will require better understanding by decisionmakers of the important socioeconomic benefits that protected areas can provide and strong and vocal public support for conservation. Twenty-five years after the three Rio Conventions—CBD, UNFCCC, and UNCCD—came into being, it seems timely for a transformative change and recognition that protected and conserved areas are an essential and cost-effective part of sustainable development, helping to address biodiversity loss, climate change, and land degradation and supporting human welfare and well-being.

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