A Pathway for Inland Waters in the 30 x 30 Target

Building knowledge and capacity for a radical increase in representation and effective management of inland waters in protected and conserved areas

The Nature Conservancy

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Executive Summary

Inland waters – such as lakes, rivers and streams, marshes, and peatlands – are amongst the most biodiverse but also the most threatened ecosystems on the planet. Yet, despite their importance, they have often been undervalued in conservation discourse and investment, in terms of restoration, protection and sustainable management. **This discussion document aims to bring inland waters into the heart of the Global Biodiversity Framework** (GBF). It describes a range of area-based inland waters approaches that can contribute to 30x30; lays out a process for how this can be measured over time; and gives practical advice to managers of protected areas and other effective area-based conservation measures. This publication is a draft, released in time for the 15th Conference of Parties of the Convention on Biological Diversity, with the goal of fostering constructive dialogue and ambition for the representation of inland waters in the GBF and monitoring framework. A substantially revised version will be published in 2023, as technical guidance for implementation.

To achieve the goals of halting and reversing nature and biodiversity loss by 2030, targets and indicators must explicitly represent inland waters

Inland water biodiversity is rich but highly threatened. Inland water ecosystems have the greatest species diversity per unit area and high endemism. But they have lost proportionately more biodiversity than land or sea, with almost one in three freshwater species threatened by extinction. Monitored populations have declined 83% on average, twice the rate of marine and terrestrial biodiversity, and less than a fifth of preindustrial wetlands remain, where detailed surveys have been made. Habitat loss drives the decline of 80% of threatened freshwater species, while agricultural pollution, invasive species and climate change all cause serious disruption.

Yet, natural inland waters provide irreplaceable ecosystem services including drinking and irrigation water, food security, flood- and drought risk reduction, pollution control, and carbon sequestration and storage. One third of our global food production relies on rivers and forty per cent of the global fish protein consumed by humans comes from inland water fish species.

Their integrity is vital to mitigate and adapt to climate change. Most of the global soil carbon pool is in wetlands, particularly peatlands, and needs careful management. Peatlands are powerful carbon sinks, storing twice as much carbon as the world's forests. In terms of adaptation, climate change is in large part manifested through water, and healthy inland water ecosystems and are more resilient to these changes.

Treating inland waters as part of the terrestrial realm has resulted in their neglect, impacting the extent, management effectiveness and resilience of inland waters in protected and conserved areas. Explicit inclusion of inland waters ecosystems in the area-based conservation targets, indicators and implementation mechanisms is critical to recover and safeguard some of the most threatened ecosystems and biodiversity on the planet. The GBF provides an important and timely opportunity for mobilising support and commitment for inland waters conservation . GBF targets and indicators should be integrated with other global treaties and commitments, including the Sustainable Development Goals, Convention on Migratory Species and the Ramsar Convention on Wetlands.

Inland water protections can draw on an array of established and emerging mechanisms - from national parks and biosphere reserves to community fish sanctuaries, fluvial reserves and carbon capture areas

In combination, the area-based targets, including the 30x30 target, provide a unique chance to halt and restore losses, via well-designed and managed protected areas and "other effective area-based conservation measures" (OECMs). While the attention to protected and conserved areas has often focused on designation and management as either terrestrial or marine protected areas, there are a multitude of approaches that contribute to protecting inland waters ecosystems and dependent biodiversity. To illustrate the complement of mechanisms and approaches, we provide a brief overview of thirty-seven cases across a representative range of geographies, designation and management focus, scale, governance types, ecosystem types, conservation objectives and ecosystem services and outline their potential contributions to the 30 x 30 target as a protected area and/or an OECM.

From these cases, we find that inland water protections are often layered, using more than one mechanism, including restoration (aligned with Target 2). Inland water protections draw on an array of mechanisms: river reserves, free-flowing protections, and legal rights of rivers; fishery reserves, recreational fishing areas, and hunting reserves; cultural heritage areas and sacred sites; source water protection areas and aquifer recharge sites; riparian buffer zones and floodplain reserves; avalanche protection zones and coastal marshlands as storm protection; migratory and climate corridors; carbon capture areas; and more.

Approaches must be equitable, inclusive and support Indigenous Peoples and local communities. It is critical to recognise the rights, knowledge and contributions of Indigenous Peoples and local communities (IP & LCs), for example in terms of access to and knowledge of freshwater fish populations. Application of the UN's Principles on Human Rights and the Environment and of Free, Prior and Informed Consent are essential to ensure IP & LC support for actions in their territories. Initiatives should prioritize models of Indigenous- and community-led conservation, co-management and benefits sharing. Community engagement and Traditional Ecological Knowledge (TEK) should be included at the earliest stages of scoping including identification of values, indicators, monitoring and management.

Priorities are to improve management of existing protected areas and to optimise location and design of new protected areas and OECMs. The aim of durable inland water protection is to create integrated regional networks that preserve critical connections between terrestrial, inland water, coastal and marine environments, now and in a changing climate. Early gains can be made by introducing and improving inland water-focused management within existing 'terrestrial' protected areas and OECMs. A slowly growing body of information highlights the exponential biodiversity- and cost-benefits of intentionally designating, designing, and managing protected areas for integrated terrestrial and freshwater biodiversity and service outcomes, especially when freshwater conservation is a central objective in spatial planning.

Systematic conservation planning across biomes is important to ensure that both new and existing protected areas and OECMs deliver effective inland water conservation. Such planning needs to be participatory, efficient, effective and of sufficient size and configuration to connect key elements of the waterscape, maintain biodiversity and climate resilience. Existing and new designations should consider the unique needs of inland water ecosystems including landscape/watershed context, maintaining connectivity (lateral, longitudinal, and vertical), water quality, flow regimes, and complex management authorities.

Inclusion of inland waters in the Post-2020 GBF area-based targets, including the proposed 30x30, requires the ability to establish a baseline and measure progress against it.

Measuring progress towards the 30x30 target requires establishing a *baseline* (extent of inland waters protection and proportion already conserved) and measuring *progress*. Terrestrial metrics alone are inadequate, because protected lands do not necessarily confer effective protection to the inland waters that they encompass. Moreover, land-based metrics provide no window into the representation of inland waters in protected area systems. Aichi Target 11 set a 17% protection target for inland waters but lacked a standard global measurement mechanism. In recent years, several methods and datasets have been proposed for measuring global coverage of inland waters protection. Interpreted collectively, they provide valuable indicative estimates. We can estimate that globally, at least 15% of the extent of inland waters are covered by protected areas.

This baseline is considered to be only indicative for several reasons: 1) global inland waters datasets are incomplete, especially for wetlands; 2) the approaches do not incorporate upstream, downstream, and catchment influences, which are known to be critical to freshwater ecosystem health; 3) the calculations include all protected areas, although currently we cannot determine which protected areas in the World Database of Protected Areas include freshwater management objectives and therefore could be assumed to provide freshwater conservation; 4) OECMs have strong potential to confer protection to inland waters, depending on their design and management, and improved OECM datasets may lead to increased coverage calculations.

A global expert consortium is working together to develop a readily implementable methodology that uses best available data to define the global extent of inland waters and to track coverage in protected areas and OECMs. There is commitment to develop a method that is simple, has clear caveats, and can serve as a foundation to accommodate growth and complexity over time. This will constitute guidance for immediate application of the draft Target 3 headline indicator. Additionally, the consortium will provide a roadmap for improving inland waters data layers over the next 5 years; for integrating information on inland waters protection into the World Database on Protected Areas and OECMs; and for refining measurement of an indicator using new and improved data. The recommendations will consider approaches to streamline with related reporting, like SDG 6.6.1.

Coverage by protected areas. As past studies have demonstrated, and recent expert workshops confirmed, measuring coverage of inland water systems by protected and conserved areas is possible. Building on existing methodologies, we are proposing an approach that can be applied globally. Countries can adopt global results or tailor the approach to employ more comprehensive or higher resolution national-level datasets.

The extent of protection coverage for inland waters can be reported in percentage form, to align with the proposed Target 3 headline indicator. However, river and stream coverage should be measured using linear units (i.e. kilometers) and should be reported separately from lakes and wetlands. We also strongly encourage assessments of representation across different size classes and relevant biogeographic units. For instance, past studies have revealed that large downstream rivers have substantially lower protection levels than small headwear streams, and each system type is characterized by markedly different biotas.

Tracking effectiveness. The 30 x 30 target is about more than coverage. Resulting areas must be ecologically representative, well-connected, effectively managed and equitably established and managed as well as integrated into wider landscapes and seascapes. In parallel to rolling out an approach for measuring protection coverage of inland waters using data available today, a consortium of organizations and experts will be developing a vision for what will be required to measure effective inland waters protection by 2030 and charting a pathway for achieving that vision. This is expected to include a recommendation for the delineation and validation of a globally comprehensive set of inland waters Key Biodiversity Areas (KBAs). Target 3 contains a component indicator for areas of high biodiversity importance, as measured by KBAs, but terrestrial KBAs do not adequately capture the distinct biodiversity of inland waters.

Effective protection must also account for the role of connectivity in supporting functioning inland waters systems. For that reason, a measure of connectivity should be incorporated into the post-2020 Global Biodiversity Framework, not only for Target 3 but also for Target 2 and Goal A. An indicator already exists in the form of the connectivity status index (CSI), which measures the global status of river connectivity across several axes (lateral, longitudinal, vertical and temporal) and includes a methodology to apply the index at multiple scales.

High-level recommendations for the Post-2020 Global Biodiversity Framework and Monitoring Framework

In the context of the post 2020 GBF, the importance of, threats to, and under-representation of inland waters in protected area policies suggests a need for **explicit inclusion of 'inland waters' in Targets 1, 2 and 3 and their indicators.**

Proposed additions **(in bold)** to headline and component indicators for the Post-2020 Global Biodiversity Framework

Goal/ Target	Component	Headline Indicator	Component Indicator
Goal A	Connectivity of natural ecosystems		**Connectivity status index (CSI; replacing River Fragmentation Index, currently listed as a complementary indicator)**
Target 2.	Extent of degraded river ecosystems under restoration		Length of degraded river habitat under restoration (using CSI degradation threshold)
Target 3.	Area protected and conserved	**Inland waters** coverage by protected areas and OECMs	
	Areas of particular importance for biodiversity protected and conserved		Protected area coverage of **inland waters/freshwater Key Biodiversity Areas**
			Protected area coverage of free-flowing rivers, as measured by CSI

Section 1: Introduction: the need for a focus on inland water conservation

Key messages

- Inland water ecosystems are among the most threatened on the planet and the biodiversity they support is being lost at twice the rate of marine and terrestrial ecosystems.
- Treating inland waters as part of the terrestrial realm has resulted in their neglect, impacting the extent, effectiveness and resilience of inland waters in protected and conserved areas.
- Explicit inclusion of inland water ecosystems in the area-based conservation targets, indicators and implementation mechanisms is critical to recover and safeguard some of the most threatened ecosystems and biodiversity on the planet.
- Such actions are also needed to maintain and restore a range of critical ecosystem services, including those related to food and water security and disaster risk reduction.
- Investments can and should be aligned to deliver solutions across related global treaties and commitments including the Ramsar Convention, Sustainable Development Goals, and UN Framework Convention on Climate Change, among others.

Inland waters – such as lakes, pools, rivers, streams, marshes, peatlands – are amongst the most biodiverse but also the most threatened ecosystems on the planet. Yet despite their importance, they have often been undervalued in conservation discourse and investment, in terms of restoration, protection and sustainable management. **This document aims to bring inland waters into the heart of the Global Biodiversity Framework**. It describes a range of area-based approaches that can contribute to 30x30; lays out a process for how this can be measured over time and gives some practical advice to managers of protected areas and other effective area-based conservation measures.

The following section (Section 1) briefly introduces some of the reasons why we need to focus more attention on inland waters, their status and level of threat, and makes the case for why conservation strategies must take these critical ecosystems more fully into consideration in the future. The new Global Biodiversity Framework (GBF), being negotiated by the UN Convention on Biological Diversity (CBD), provides a much-needed opportunity to make a fresh start. Section 2 discusses different approaches to area-based conservation in freshwaters, further explained by a series of case studies. Section 3 offers practical advice both on establishing protected areas in inland waters and on how to increase the effectiveness of freshwater conservation in existing terrestrial protected areas that include inland waters. In Section 4, tools and methods for tracking progress are presented, including what is known now about the area of inland waters already included in area-based conservation initiatives and how change can be measured in the future. Section 5 includes some concluding remarks, lessons learned and references.

Inland waters are rich but threatened

Inland waters cover less than 2 per cent of the Earth's surface, but support 12 per cent of known species,[1] and more than half of all fish species,[2] with high levels of endemism.[3] Many species of fish are confined to a single lake or river system, making them highly vulnerable to natural and anthropogenic disturbances (e.g., wildfires, harvest, pollution, climate change). Inland waters have already lost a greater proportion of their species and habitat than ecosystems on land or in the ocean.[4] As a result, almost one in three freshwater species are now threatened with extinction, also proportionately more than for terrestrial and marine species. Monitored populations of freshwater species have declined by an average of 83 per cent (Figure 1.1):[5] for example, populations of migratory fishes have declined by 76 per cent,[6] aquatic megafauna by 88 per cent,[7] and mega-fishes by 94 per cent.[8] Less than one fifth of the world's preindustrial freshwater wetlands remain in areas where detailed surveys have been carried out, and wetlands are projected to decline to under one-tenth of the original global extent by mid-century under current trends, with imminent threats from megaprojects such as dams.[9]

- Out of 177 of the world's large rivers, only a third remain free flowing.[10]
- Freshwater biodiversity is under particular threat: populations of migratory fishes have declined by 76 per cent,[11] aquatic megafauna by 88 per cent,[12] and mega-fishes by 94 per cent.[13] Problems do not only relate to vertebrates, for example a third of freshwater molluscs assessed are also judged to be at risk of extinction.[14]

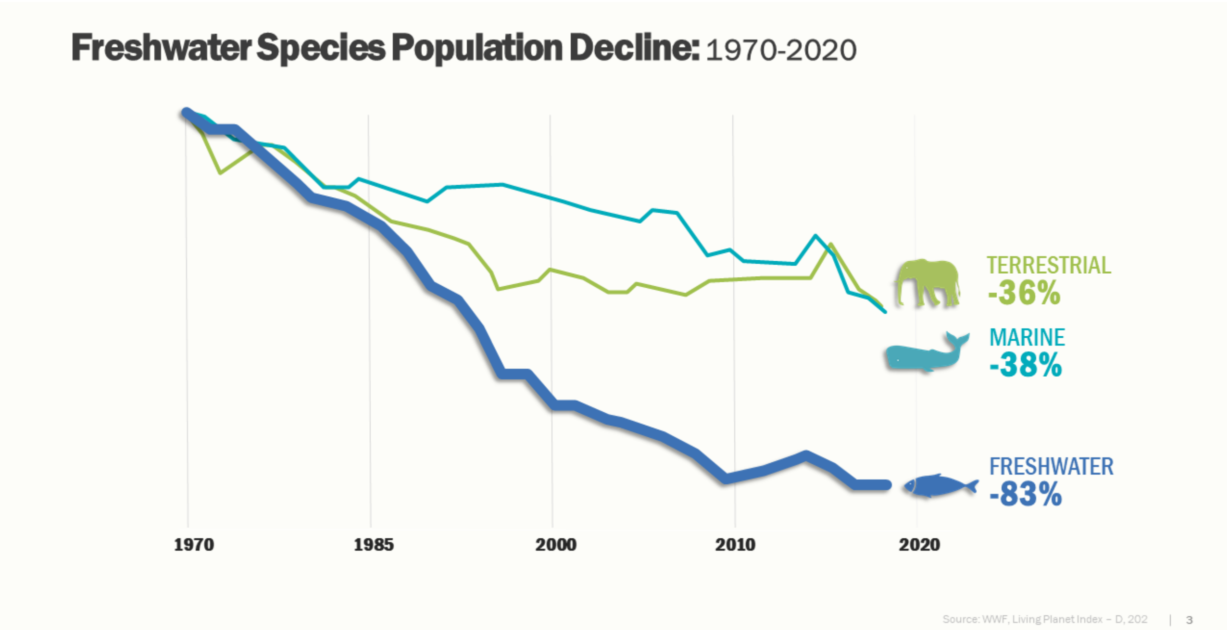


Figure 1.1. **Monitored freshwater species populations from 1970-2020** (**WWF Living Planet Report 2022)**

Natural freshwater ecosystems provide critical ecosystem services.[15] They include provision of reliable supplies of drinking and irrigation water,[16] including rice paddies,[17] other support for food security including particularly freshwater fishes; disaster risk reduction, including reduction of flood damage by retaining natural floodplains and riparian vegetation; pollution control through natural wetland processes;[18] delivery of sediments and nutrients to feed downstream deltas and floodplains;

cultural services; and if managed correctly also provide critical carbon sequestration and storage.[19] While the value of these ecosystem services is being acknowledged, major challenges remain in increasing investment and research relating to their recognition and management.[20]

Freshwaters and carbon. The majority of the global soil carbon pool is held in wetlands, where conditions slow decomposition and facilitate carbon accumulation.[21] Peatlands are very powerful carbon sinks, holding the largest, long-term store of any ecosystem. Despite covering only 3 per cent of the land surface, they store twice as much carbon as the world's forests.[22] Mangrove forests (sustained by freshwater inflows) are also "carbon dense" ecosystems,[23] and their role in sediment trapping may also help some wetlands to keep pace with sea level rise.[24] But changing temperature and precipitation regimes due to climate change can shift the balance of these processes, causing wetlands to become carbon sources. Climate mitigation benefits from peatlands are also partially counteracted by release of methane, a potent greenhouse gas.[25] Careful management, lack of disturbance and in some cases restoration is therefore required to maximise wetland climate benefits.

- One third of the global food resource depends on rivers and forty per cent of the global fish protein consumed by humans comes from freshwater fish species.[26,27]
- A third of the world's hundred largest cities get a significant proportion of their drinking water from protected areas,[28] which maintain purity and in many cases are important for maintaining natural flow regimes including base flow and flood magnitude.[29]
- Peatlands alone hold an estimated 600 Gt of carbon, making them a globally significant stabiliser in response to climate change.[30]

Inland waters are critical for communities and human livelihoods.[31] Inland waters provide protein and essential micronutrients from fish and other freshwater species,[32] building materials, drinking and irrigation water, while rivers and lakes are often an essential route for transportation.[33] They also provide sources of learning and inspiration, tourism and recreation, while supporting spiritual and sacred values,[34] mental and physical health[35] and a sense of place.[36] For these reasons, inland waters are a focus of human settlements.

- Lake Skadar, straddling Montenegro and Albania, is a protected area generating 80 kg fish/ha/year, bringing US$2.1 million a year to the economy.[37]
- Sixty percent of Cambodia's animal protein comes from fish in Tonle Sap Lake biosphere reserve.[38]
- Loch Garten Nature Reserve in Scotland attracts around 22,000 visitors a year, generating approximately US$3.3 million each year in recreational value.[39]
- Thousands of pilgrims visit the high Himalayan wetland of Mansarovar for spiritual atonement every year,[40] one of innumerable sacred lakes, wells and rivers found all over the world.

Threats are growing. Habitat loss, including fragmentation, is a contributory factor to the decline of 80 per cent of threatened freshwater species.[41,42] Climate change is altering the temperature and flow regimes of inland waters,[43] including rivers[44] and riparian ecosystems,[45] and can shift wetlands from carbon sinks to carbon sources.[46] Proposed dams threaten the free-flowing status of 260,000 km of rivers.[47] Pesticides,[48,49] fertilizers[50] elevated sediments and waste water pollution, and invasive species disrupt ecosystem balance.[51] Fifty million hectares of peat has been drained, responsible for ~4 per cent of anthropogenic greenhouse gas emissions. By 2100, without significant restoration effort, this could grow to 12-14 per cent of the emission budget needed to keep global warming at less than 1.5°C.[52,53]

- In rivers draining the headwaters of the Amazon, 146 large hydroelectric dams are already operating or under construction, and 160 are planned.[54] If all proposed dams are built there will only be three free-flowing tributaries remaining.[55]
- Across Africa, annual costs of invasive water hyacinth have been estimated at $100 million.[56]
- A global analysis found over half the detected insecticide concentrations in freshwater exceeded regulatory limits.[57]

Box 1: **Results from the *Global Wetlands Outlook***

The latest edition of the *Global Wetlands Outlook*[58] from the Ramsar Convention reports that:

- Despite widespread declines, global total wetland area is a minimum of 1.5-1.6 billion hectares.[59]
- Wetland quality appears to be declining at the same time as wetland area: in 2017, more Ramsar Parties reported deterioration than improvement in wetlands' ecological character state.[60]
- Regional studies indicate that agricultural development is often the primary cause of wetland degradation and loss.[61,62,63,64]
- Water quality continues to decrease due to pollution from multiple sources including from wastewater[65] and agriculture,[66] and from microplastics,[67,68] with significant impacts on human health.[69]
- Most of these impacts are compounded by the effects of climate change.[70]
- Arctic and montane wetlands are at particular risk from climate change with profound consequences for the ecosystem services they provide.[71]

Treating inland waters as part of the terrestrial realm has resulted in their neglect in conservation investments. Several assessments have been completed to estimate the extent of inland waters in protected areas (Table 4.1). But many protected and conserved area systems have been established without adequate consideration of inland waters during planning and with their day-to-day management not directed at the unique needs of inland waters.[72,73,74]

A growing body of information highlights the exponential benefits of intentionally designating, designing and managing protected areas for integrated terrestrial and freshwater biodiversity and service outcomes, especially when freshwater conservation is a central objective of spatial planning.[75] At the same time, the dynamic, connected nature of inland waters often requires tailored attention in designations, which may differ from designations targeting terrestrial and marine conservation.[76] When identified and managed with the needs of inland water biodiversity in mind, mechanisms for protection can include protected areas like national parks and biosphere reserves, other effective area-based measures like community-managed river reserves,[77] as well as inland water-focused tools like national river conservation systems, specific laws and edicts and the relatively new concept of Rights of Rivers, already applied legally to several rivers around the world.[78,79,80]

Box 2: **What the area-based targets of the Global Biodiversity Framework entail**

Together, Targets 1, 2 and 3 are the area-based targets of the GBF with the collective goal of halting biodiversity loss. Target 1 provides high level guidance about the need for integrated biodiversity-inclusive spatial planning for whole landscape/seascapes, while Target 2 focuses on the necessity in many cases to include restoration in conservation plans. Implementing the GBF for inland waters will include a large emphasis on protected and conserved areas, under Target 3, which is the main focus of the current document, with the recognition that achieving the goals of the GBF will require investments in all three area-based measures, globally.

While still under discussion, the GBF Target 3, closely related to the 30x30 ambition, has included some regular components throughout the period of its development:

The target is:
- 30 per cent of land and ocean, including all terrestrial, inland water, coastal and marine ecosystems
- 30 per cent as a global target rather than applying to every country equally
- Enabled with protected areas and OECMs

The target must address:
- Areas of importance for biodiversity
- Contributions to people

And the resulting areas must be:
- Ecologically representative
- Well-connected
- Effectively managed
- Equitably established and managed
- Integrated into wider landscapes and seascape

The post-2020 Global Biodiversity Framework (GBF)[81] provides an important and timely opportunity for mobilising support and commitment for conservation of inland waters. Integrated with global treaties and commitments including the Sustainable Development Goals, Convention on Migratory Species and the Ramsar Convention on Wetlands, explicit consideration of inland water ecosystems in the goals, targets and indicators of the post-2020 GBF is a critical part of efforts to recover and safeguard the most threatened and least protected ecosystems on the planet. This may include both threatened ecosystems and ecosystems that are relatively pristine and should be conserved as such. This document focuses primarily on draft Target 3, focusing on the enhanced role of protected and conserved areas. It should be noted that, whilst a critical component, protected areas and OECMs are only part of the response required and the GBF contains other targets, of equal importance. In this context, draft targets 1 and 2 are particularly significant:[82]

- draft Target 1. Ensure that all areas globally are under integrated biodiversity-inclusive spatial planning addressing land- and sea-use change, retaining existing intact ecosystems…

- draft Target 2. Ensure that at least 20/30 per cent of areas of degraded terrestrial, inland waters, coastal and marine ecosystems are under restoration…

From the perspective of inland waters, these targets suggest that broader scale planning, a focus on the most important areas for biodiversity and ecosystem services, and a focus on restoration will all be essential in meeting the wider aims of the GBF.

Box 3: **A note on terminology**

Three terms are in common use and are often treated as if they are the same. **Freshwater** refers to any water system that is not saline, including most lakes, rivers, pools, marshes and peatlands. Inevitably, there are places where the distinction between fresh and saline water becomes indistinct, in estuaries and river outflows, and the relative salinity levels will change with the state of the tide and the period of the moon. Additionally, some waters found far inland contain high levels of salinity; the Dead Sea is a well-known example but far from unique. For this reason, many people prefer to use **inland water** as a more comprehensive term than freshwater. Additionally, **wetlands** are often assumed to be equivalent to inland waters, but at least in the definition used by the Ramsar Convention on Wetlands, they include coastal waters and inshore sea areas. Ramsar data also include artificial wetlands, which many other statistics do not. For the purposes of statistics e.g., species at risk or trends in water area, inland waters and freshwaters should be viewed as roughly equivalent, whereas wetlands – particularly in data from Ramsar – will be different. We tend to use "inland water" here unless information is referencing freshwater directly.

The definitions being applied here are:

- **Freshwater ecosystems**: any ecosystem characterised by naturally occurring ice or water containing low concentrations of dissolved salts and other total dissolved solids. In practice, areas such as mineral-rich springs are included within freshwaters.
- **Inland waters**: aquatic-influenced environments located within land boundaries. This includes those located in coastal areas, even where adjacent to marine environments. Inland water systems can be fresh, saline or a mix (brackish water). Terminology can confuse; inland water bodies include the Caspian Sea (freshwater) and the Dead Sea (hyper-saline), whereas the Baltic Sea (also largely freshwater) would be excluded by some. A large number of the wetlands in, for example, Australia's deep interior are saline – whereas many wetlands within only a few metres of the ocean are freshwater. Location counts, not ecological character.[83]
- **Wetlands**: The Ramsar Convention on Wetlands defines wetlands broadly as "areas of marsh, fen, peat, and or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.[84] This is probably the broadest definition of wetland and others will refer to wetlands as being primarily equivalent to freshwaters; in North America this term does not usually include rivers and lakes.

Section 2: Options for protecting and conserving inland waters

Key messages

- There are a wide range of area-based approaches used in inland waters that can contribute to the 30x30 target through recognition as protected areas or OECMs.
- Novel approaches like fluvial reserves, and national parks designed for inland water ecosystems are emerging to address the gaps in traditional protected area approaches, although their match to GBF Target 3 may have to be made on a case-by-case basis.
- The 30x30 target currently only applies to protected areas as defined by IUCN and the Convention on Biological Diversity (CBD) and other effective area-based conservation measures (OECMs) as defined by the CBD, although several other area-based approaches have a positive benefit for biodiversity

This section provides an overview of guiding criteria to assess contribution to the 30x30 target, a review of key terminology and a typology of area-based conservation approaches used in inland waters that notes their likelihood of contributing to the 30x30 target. This discussion is followed by dozens of case studies demonstrating a multitude of designation mechanisms, management approaches and contexts for protecting and conserving inland water ecosystems and the biodiversity they support.

At least 30% by 2030: What contributes to inland water protection and conservation?

As discussed in Section 1, achieving effective protection and conservation of at least 30 per cent of the planet – across terrestrial, inland water, coastal and marine ecosystems – is a critical step toward achieving the CBD's 2050 *Vision of Living in Harmony with Nature*.[85] Several thought pieces provide foundational guidance to describe the types of area-based conservation approaches that would meaningfully contribute to the target. The following five points provide a high-level summary of that guidance. Contributions should:[86]

1) Acknowledge that reaching the coverage targets is not enough to reverse the trends of ecosystem and biodiversity loss or the goal of living in harmony with nature by 2050. **Area-based conservation targets must also consider quality** – for example, areas that are of particular importance for biodiversity and ecosystem services (see subsection 2, below, for further examples).
2) **Have clear ecological indicators** and, in the case of protected areas, be **managed with nature-conservation as a dominant priority**. For inland water ecosystems, this means that protected and conserved areas should have management that is effective in sustaining those systems and their species.
3) **Include one of the four governance types** recognized by IUCN; government, shared, private and Indigenous Peoples and Local Communities (IP & LCs); areas governed and/or managed by IP & LCs should be recognized and supported by governments in accordance with rights-based approaches.

4) For recognized OECMs:
    a) Demonstrate they are **delivering effective long-term conservation of important biodiversity**, achieving the same level of in-situ or whole ecosystem biodiversity conservation as protected areas
    b) Not be intensive, multiple-use production areas that are managed with *some* biodiversity considerations (e.g., intensive production forests, plantations, reservoirs and fisheries areas).
5) **Sites that meet the criteria of a protected areas or other effective area-based conservation measure (OECM)** (see **Box 4** for an overview of these terms) should be reported to the World Database on Protected Areas as contributing to GBF Target 3.

There are several terms used to describe conservation areas. **Protected area** and **other effective area-based conservation measure** (**OECM**) are both officially defined (see box 4) and appear in international decisions such as the CBD and its GBF. In addition, the phrase "**protected and conserved areas**" is often used as equivalent to and less clumsy than "protected areas and other effective area-based conservation measures" but this is an unofficial use and "conserved area" should not necessarily be considered as equivalent to OECM; some people use this term much more loosely. Similarly, "**area-based conservation**" is also often used to describe protected areas and OECMs, but again without official designation and some people also use this term more loosely to include other area-based approaches that fit into neither protected areas nor OECMs. Standardisation of some key terms is urgently needed.

Box 4: **A note on terminology: Protected areas and other effective area-based conservation measures (OECM)**

The CBD definition of a protected area: "*a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives*."

The IUCN definition of a protected area is different, but the CBD recognises it as being equivalent: "*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 CBD definition of an "other effective area-based conservation measure (OECM)": *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*.

These definitions are all *guidelines*: the details of what does and does not "count" as a protected area or OECM are determined by national policy and laws. For example, there are differences in the way that countries view the relationship between Indigenous territories and protected areas.

OECMs were defined by the CBD in 2018, and guidance to their selection published by IUCN in 2019.[87] The distinguishing criterion is that a protected area always has a primary nature conservation objective, whereas an OECM delivers the effective in-situ conservation of biodiversity regardless of its objectives. Most OECMs will not have nature conservation objectives or have them only as secondary objectives. A few sites managed primarily for conservation may be listed as OECMs because the governing body does not wish the site to be identified as a protected area.

Many questions remain, relating to the definition and measurement of effectiveness, the rules for what defines "importance" of a site in terms of biodiversity and the implications of ineffective management. These issues are amplified for inland waters because few freshwater OECMs have been defined as yet (Bita River, Colombia is one example), and some relatively new approaches to inland water conservation – like areas designated to conserve climate corridors – have not been in place long enough for us to understand how effective they are in practice.

Although this may seem complex, it is likely to be resolved once these principles are put into practice. For this reason, we are being relatively open in identifying "potential OECMs". Experience to date, including for inland waters, suggests that few designations will inevitably be equivalent to an OECM, and decisions are needed on a case-by-case basis. This is reflected in our typology.

A Typology of Area-Based Conservation for Inland Waters: Protected Areas and OECMs

While the attention to protected and conserved areas has often focused on designation and management as either terrestrial or marine protected areas, there is a multitude of designated protected areas that provide protection of inland water ecosystems and dependent biodiversity. To illustrate the complement of mechanisms and approaches, we provide a brief overview of thirty-seven cases across a representative range of:

- **Geographies**: Including dozens of countries across six continents (**Figure 2.1**).
- **Designation and management focus**: Some protected areas are designed, designated and managed mainly or entirely for their fresh or saline waters. More often, inland waters occur but have not been comprehensively considered in the design of the area and are not prioritised in management (**Figure 2.2**). For example, a survey of PA managers in a well-resourced area, the Tennessee-Cumberland Basin in the USA, found that most PAs have fewer resources dedicated to freshwater conservation and management than to other activities, and some PAs completely lack resources for freshwater management.[88] The ease with which these ecosystems and habitats can be conserved or restored depends partly on whether the whole or most of the focal habitat is within the protected area or OECM – if a river runs only a short distance through an area it will be harder to manage the influence of threats originating externally such as pollution or overfishing.
- **Scales**: range from transboundary protections like the 5-country Mura-Drava-Danube Rivers biosphere reserve or whole-lake ecosystems, to small, individual wetlands protected to conserve critical stop-over habitat for bird migration or river reaches to conserve discrete habitats for highly range-limited species.

- **Governance types**: range from national and state governments to various forms of shared governance, private governance and governance by Indigenous Peoples and Local Communities.
- **Mechanisms**: include traditional protected areas like national parks and emerging mechanisms like fluvial reserves and rights-of-rivers in addition to potential OECMs, including some Ramsar sites.
- **Inland water ecosystem types**: lakes, pools, springs, wetlands, peatland, fresh, brackish, headwaters to large rivers, including groundwater-dependent ecosystems.
- **Biodiversity conservation objectives**: ranging from whole ecosystems to species at risk and dependent on inland water ecosystems, from megafauna like hippos, crocodiles, pink river dolphin, giant otters, to migratory and wading birds, aquatic macroinvertebrates including freshwater mussels, endemic lake fishes, migratory fishes and freshwater turtles.
- **Ecosystem services**: carbon sequestration, water provisioning, community fisheries, flood-risk reduction and related climate adaptation.

These cases are used to present a typology of area-based conservation mechanisms for inland waters, how they may be classified as protected areas or OECMs and implications for their contribution to the 30x30 target (**Table 2.1**). This includes IUCN/CBD protected area categories, areas designated under international conventions and other area-based approaches.

Figure 2.1: **Global map of case studies**

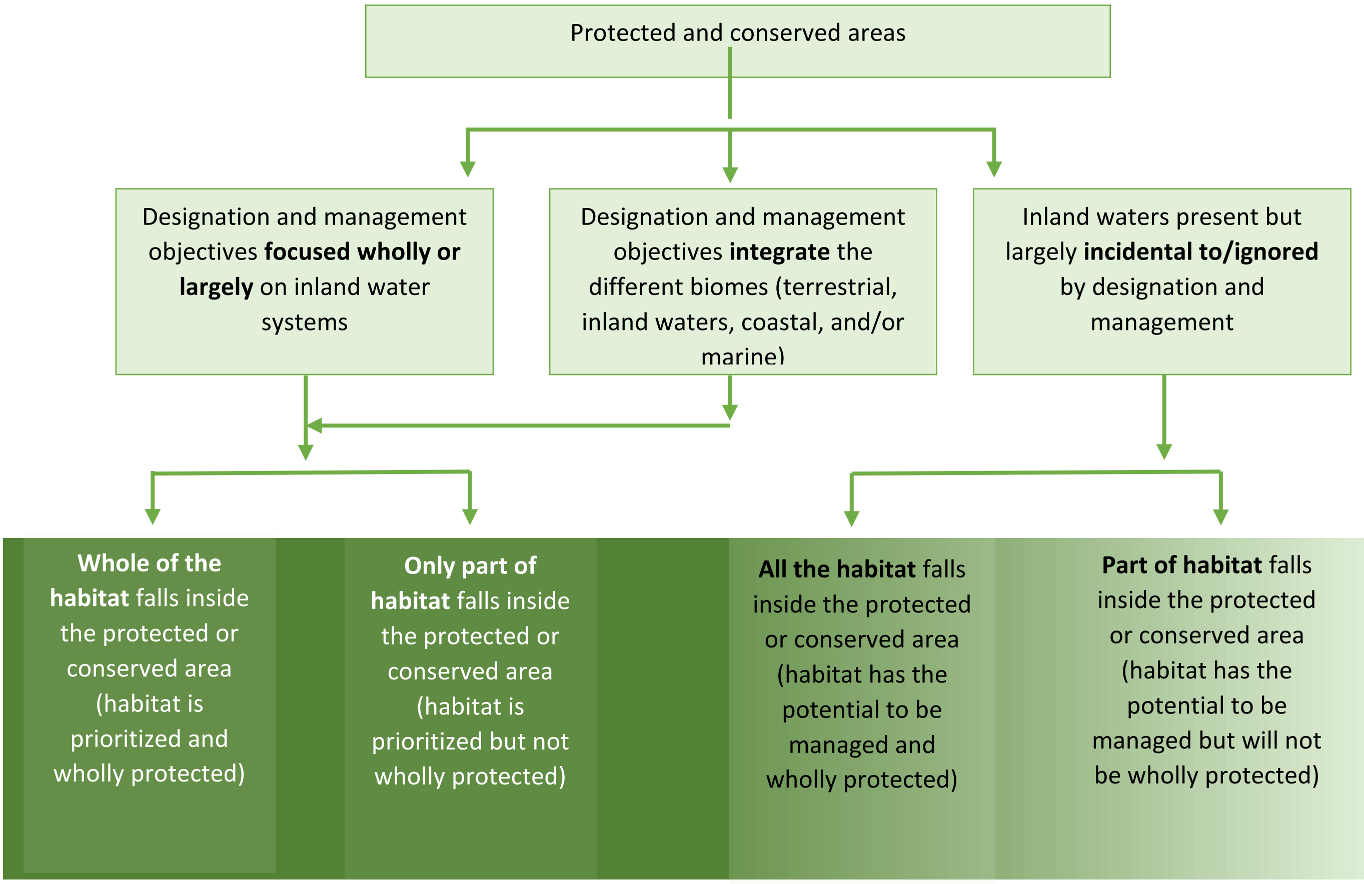


Figure 2.2: **Gradient of existing scenarios of inland water conservation inside protected and conserved areas. Darker green = higher potential for effective protection. All scenarios have potential for improved management.**

A typology of inland water conservation

Currently, contributions to the 30x30 target are limited to protected areas and OECMs (there is also a lobby calling for wider representation of other territories of Indigenous peoples). While protected areas are well defined and codified in law in virtually every country of the world, OECMs are a newer category of conservation, where despite the agreement of an international definition, many questions remain in terms of what counts in practice.

One early lesson is that there are no short-cuts to identification, i.e., there are no existing designations or uses that will invariably lead to an area being classified as an OECM. Many uses *can* be OECMs given the right set of conditions, but these will need to be judged on a case-by-case basis and depending on the conservation outcomes. Figure 2.3 below shows this graphically.

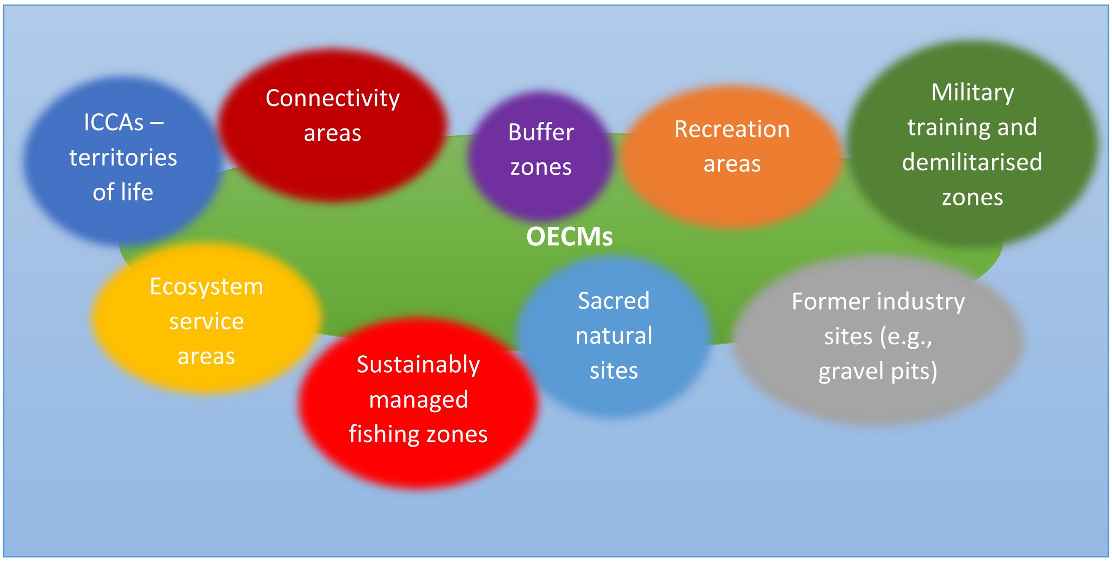


Figure 2.3: **Relationship between area-based approaches and OECMs**

Furthermore, the distinction between protected areas and OECMs is not always clear-cut. Some existing protected areas would probably have been designated as OECMs if this option had been available when they were gazetted. Some OECMs may over time become protected areas.

Indeed, many of the designations described in this section have only a partial match with GBF Target 3, although all contribute to the wider aims of the GBF. Decisions on individual cases can be made with reference to IUCN's guidance on protected areas,[89] and its developing guidance on OECMs.[90,91]

The plus side of this early implementation period is that there are many more options to consider under 30x30. In the following section we summarise these options, provide a simple descriptor, example and colour-coded guidance as to whether each designation is likely to be a protected area or an OECM, and whether it is likely to count towards 30x30. Each management mechanism is illustrated by at least one case study to provide real-life examples. Finally, some of the newer management approaches are described and a general analysis of opportunities for freshwater conservation is given.

Table 2.1: **Typology of area-based conservation initiatives for inland waters and links with protected areas, OECMs and the 30x30 target**.

Over the next few pages, a list of different area-based conservation approaches are described and their links to protected areas, OECMs and the 30x30 target assessed.

Assessments are based on whether the designation type or protection mechanism can *in and of itself* can be equivalent to a PA/OECM or contributes to the 30x30 target. So e.g.,

- the core area of a UNESCO Biosphere Reserve should almost always be considered *equivalent to* a PA, whereas
- a source water area might be a protected area, or an OECM, or neither

In addition, the assessment applies to the inland water habitat(s) that fall within the geographically defined space for the PA/OECM.

Key

Always or almost always the case

More likely than not to be the case

Sometimes the case

Rarely the case

Never or almost never the case

Each of the interventions outlined in the table is accompanied by either a thumbnail case study or a larger case study; these will include explanation of what the designation means.

The column “Likelihood of contributing to 30x30?” implies that the contribution is to the inland water component but does not necessarily mean that the whole area contributes to inland water. For example, a “source water protection area” will have terrestrial areas and aquatic areas.

Table 2.1: **Typology of area-based conservation initiatives for inland waters**

Management objectives	**Designation type or management mechanisms**	**Where is the intervention likely to take place?**		**Likelihood of contributing to 30x30**	**Examples**
		PA	**OECM**		
Areas that meet the IUCN/CBD definitions of protected areas					
Conservation	IUCN Category Ia protected areas			As a protected area, will always contribute	Prek Toal Core Area, strictly protected part of Tonle Sap Biosphere Reserve (Cambodia)
	Category Ib protected areas			As a protected area, will always contribute	Fossil Springs Wilderness (USA)
Conservation	IUCN Category II protected areas			As a protected area, will always contribute	Upper Navua Conservation Area (Fiji) Lake Malawi (Malawi)
Conservation	IUCN Category III protected areas			As a protected area, will always contribute	Gachedili Canyon Natural Monument (Georgia)
Conservation	IUCN Category IV protected areas			As a protected area, will always contribute	Laguna Torca (Chile)
Conservation	IUCN Category V protected areas			As a protected area, will always contribute	Zones humides de ''Onilahy (Madagascar)
Conservation	IUCN Category VI protected areas			As a protected area, will always contribute	Pacaya-Samiria (Peru)
Conservation	Indigenous Protected Areas (not an official IUCN definition)			IPAs are formally part of a national PA system, self-declared and managed by Indigenous peoples	Gayini Nimmie-Caira (Australia) Fish River (Australia)
Areas designated under international conventions					
Conservation	UNESCO natural World Heritage sites			A few early natural WH sites are not formally PAs, but the large majority are (including all new sites)	Ivindo River World Heritage Site (Gabon)
Conservation	UNESCO Biosphere reserve – core area			The core of the biosphere is made up of one or more protected areas	Mura River Biosphere Reserve (Slovenia)
Conservation	UNESCO Biosphere reserve – buffer zones			Buffer zones might be protected areas but the large majority are not, many others would qualify as OECMs	
Conservation	UNESCO Biosphere reserve – transition zone			Transition zone will seldom if ever be a PA, some will be OECMs, less likely than buffer zone to meet 30x30	
Conservation	Ramsar sites			Most Ramsar sites are PAs, many others qualify as OECMs, so more likely than not to contribute to 30x30.	Bita River (Colombia)
Other area-based approaches					
Conservation	Species-specific reserves			Conservation areas for a single species are not PAs/ OECMs but if other spp. are also conserved this counts	Upper Yangtse Fish Reserve (China)
Conservation	River reserves			Usually not full PAs, many but not all will be OECMs. Likelihood of meeting 30x30 will therefore vary.	Sarapiquí River (Costa Rica), Fluvial Reserves (Spain)

Management objectives	Designation type or management mechanisms	Where is the intervention likely to take place?		Likelihood of contributing to 30x30	Examples
		PA	OECM		
Conservation	Seasonal wetland and floodplain reserve			Usually not full PAs, many will be OECMs. Likelihood of meeting 30x30 will vary, but more likely than not.	Kadwa Kosi Floodplains (India)
Conservation	Rights of Nature/ Rights of Rivers			Applies to entire rivers so unlikely all to be PA, might be OECM, variable role in 30x30	Rio Atrato (Colombia)
IP & LC land/sea and territories	ICCAs – Territories and areas conserved by Indigenous peoples and local communities			Will often either be PAs or OECMs, most but not all ICCAs will therefore contribute to 30x30	Paraku (Western Australia)
IP & LC land/sea and territories	General IP & LC lands, waters and territories			Some IP & LC territories will be PAs or OECMs, but not all; contribution to 30x30 on a case-by-case basis	Great Bear Rainforest (Canada)
IP & LC land/sea and territories	Cultural heritage areas			Few will be PAs, more change of being within an OECM, contribution to 30x30 on a case-by-case basis	Krupa River (Croatia)
Provisioning/regulating /supporting	Source water protection areas			Can be a PA, or OECM, or neither; likely to be one or the other and thus more likely than not to meet 30x30	Rwenzori Mountains National Park (Uganda)
Provisioning/regulating /supporting	Water reserve			Can be a PA, OECM or neither, contribution to 30x30 judged on a case-by-case basis	San Pedro Mezquital Environmental Water Reserve, Mexico
Provisioning/regulating /supporting	Carbon capture areas, biodiversity offset, e.g., peatland			Can be a PA, OECM, or neither; contribution to 30x30 judged on a case-by-case basis	Mawas peatlands (Indonesia)
Provisioning/regulating /supporting	Aquifer recharge area			Can be a PA, OECM, or neither; contribution to 30x30 judged on a case-by-case basis	Susupe Wetland (Spain); San Pedro River (United States)
Provisioning/regulating /supporting	Fisheries reserves			Many permanent fisheries reserves are likely to be OECMs, a small proportion may be PAs	Mae Ngao River Community Reserves (Thailand); Lake Tanganyika (Africa),
Provisioning/regulating /supporting	Riparian protection strips			Can be a PA, OECM, or neither; contribution to 30x30 judged on a case-by-case basis	Mongolia Riparian zones; Broken Boosey Park (Australia)
Provisioning/regulating /supporting	Coastal marshland as storm protection			Can be a PA, OECM, or neither; on balance most will be PA or OECM and therefore count towards 30x30	Biloxi Marsh. Louisiana (United States)
Provisioning/regulating /supporting	Protected floodplains			Can be a PA, OECM, or neither; on balance most will be PA or OECM and therefore count towards 30x30	Dyfi Valley Biosphere Reserve (Wales, UK)
Provisioning/regulating /supporting	Area-based pollution control (e.g., nitrate exclusion zones)			Can be a PA, OECM, or neither; contribution to 30x30 judged on a case-by-case basis	Rio Muelas River Reserve (Spain)
Cultural services	Sacred lakes, pools, springs and wells			Can be a PA, OECM, or neither; strict protection and community support means likely to count to 30x30	Mai Pokhari (Nepal)
Cultural services	Sacred rivers			Applies to entire rivers so unlikely all to be PA, might be OECM, variable role in 30x30	River Ganges, India
Connectivity	Migratory swimways			Rivers that support the migration routes of ecologically or socio-economically important fish species.	Parnau River (Estonia)

Management objectives	Designation type or management mechanisms	Where is the intervention likely to take place?		Likelihood of contributing to 30x30	Examples
		PA	OECM		
Connectivity	Free-flowing rivers or river stretches			Designated sections of rivers may be PA or OECM, variable role in 30x30	Upper Delaware River Wild and Scenic River (United States)
Connectivity	Climate corridors			Areas that form the best route between current climate types and where those climates will occur in the future under climate change	Wild and Scenic Rivers, Oregon (United States)
Connectivity	"Stepping stones" (stopover sites) for migratory birds			Can be a PA, OECM, or neither; on balance most will be PA or OECM and therefore count towards 30x30	Laguna Mar Chiquit (Argentina) freshwater part of WHSRN
Recreation	Recreational, stocked fishing lakes			Unlikely to be PAs, a few may be OECMs, on balance unlikely to count towards 30x30	
Recreation	Recreational fishing rivers			Can be PA, OECM, or neither; some have conservation management equal to 30x30, others very little	Onon River (Mongolia)
Recreation	Wetland/game hunting reserve			Can be a PA, OECM, or neither; on balance most will be PA or OECM and therefore count towards 30x30	Parker River (United States), Bosque del Apache National Wildlife Refuge (United States)
Recreation	Artificial recreational lakes			Can be a PA, OECM, or neither; contribution to 30x30 on a case-by-case basis	North Creek Wetland, Colonel Samuel Smith Park (Canada)
Recreation	Natural recreational lakes			Can be a PA, OECM, or neither; contribution to 30x30 on a case-by-case basis	Isojärvi National Park (Finland)
Defence	Military buffer zones			Can be a PA, OECM, or neither; contribution to 30x30 on a case-by-case basis	Reflooded wetlands, north of Kyiv

Some general conclusions:

- Apart from designated protected areas, all the management approaches described have only a partial match with 30x30; some sites will fall into the target and some will not; IUCN has clear guidance on identifying protected areas is developing an approach to determining if something is an OECM.
- A number of the designations identified in the table are very likely to match 30x30 with only a few outliers falling outside either protected areas or OECMs.
- At the other end of the spectrum, only a small number are judged unlikely to ever meet the requirements of 30x30.
- These are our judgements and are likely to be challenged in some cases – e.g., the Ramsar Convention and ICCA Consortium might regard all their sites as meeting the target.

The following section includes case studies of all the examples given above, some longer and some thumbnail sketches, to provide real-life examples of how these ideas are being applied in the field

Case studies

Decisions about whether particular cases of area-based conservation approaches meet the needs of 30x30 are complex. In the following case studies, areas that the authors believe meet, or potentially meet, draft Target 3 are described, first with a series of short thumbnail descriptions and then with several more detailed cases; in total these address the full range of options outlined in Table 2.1.

Each case study suggests whether the site is a protected area or an OECM, and whether it contributes to the 30x30 target, using the same colour codes as in Table 2.1. In many of the cases, additional review and feedback is needed to accurately describe the context and status. Therefore, many of these judgements are preliminary, and the opinion of the authors using best available information; further work is needed to finalise.

Fossil Springs Wilderness, Arizona, USA

Name	*Fossil Springs Wilderness (Arizona, USA)*			
Designation type / protective mechanism	*National wilderness (IUCN category Ib) within the Coconino National Forest*	*PA*	*OECM*	*30x30*
Designation status	*Established 1984*			
Primary aim	*Preserve wilderness values and wildlife.*			
Governance type	*State (US Forest Service)*			

The 42.21 km^2 area lies at the bottom of a canyon at the edge of the Colorado Plateau, with a large and constant water flow from groundwater, springs and Fossil Creek that supports a diverse riparian ecosystem, with over 30 species of trees plus many mammals such as mountain lion, black bear and javelina, along with over a hundred species of birds.[92] The area is set in a desert landscape. The area has undergone significant restoration, including in particular the removal of an early 20th century hydroelectric system which dammed the river and diverted most of the flow.[93] Native invertebrate[94] and fish populations have recovered although with some effort for fish, including removal of non-native species and installation of invasive species barriers to prevent encroachment from downstream.[95] Upon restoration of the river's connectivity, in 2009 Fossil Creek was designated a Wild and Scenic River.[96]

Fossil Creek and surrounding riparian habitat is a government-run protected area that has been subject to considerable management and restoration and fits the 30x30 criteria. However, it has experienced serious degradation in recent years due to forest fires.

Vjosa River National Park, Albania

Name	*Vjosa River National Park, Albania*			
Designation type / protective mechanism	*Mixed, predominantly IUCN Category II protected areas*	*PA*	*OECM*	*30x30*
Designation status	*In development*			
Primary aim	*Protect the wild nature of the river (free flowing) from oil, gas and hydropower development*			
Governance type	*State*			

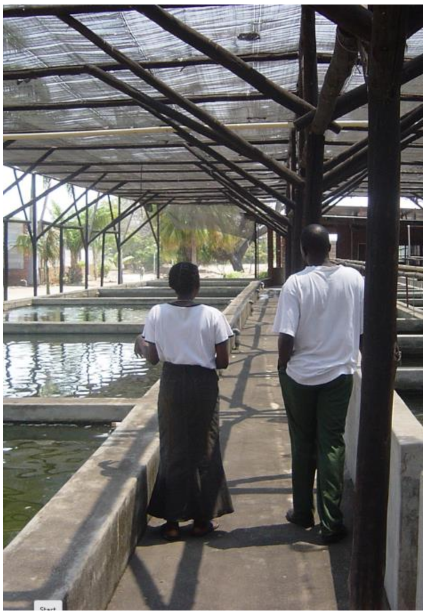
At 270 km, the Vjosa is one of Europe's last wild rivers, it provides habitat for 15 globally threatened species and cultural and economic services to 60,000 Albanians living along its shores.[97] These values have helped Blue Heart of Europe make a case for its special care and stewardship in their campaign for a National Park designation. In early 2022, the Albania Ministry of Tourism and Environment expressed their support for establishing the Vjosa as Europe's first Wild River National Park and are now drafting a framework to formalize the park with support from EurNatur, EcoAlbania, Riverwatch and the Patagonia company.[98] Assessments are underway to identify the appropriate IUCN categories and will likely result in a mosaic approach for the upper, middle and lower reaches of the river, with much of the area aligning with criteria for category II protected area.[99] As such, the planned Vjosa River National Park will contribute to 30x30.

Lake Malawi, Malawi

Name	*Lake Malawi National Park (Malawi) – Parc National du lac Malawi*			
Designation type / protective mechanism	*Protected area, IUCN category II, UNESCO World Heritage Site*	*PA*	*OECM*	*30x30*
Designation status	*1984*			
Primary aim	*The national park was established to protect the huge variety of cichlid fish in the lake, most of which are endemic, of limited distribution and many of which have yet to be described by science.*[100]			
Governance type	*State governed – Department of National Parks and Wildlife*			

The 94 km² national park exists at the southern end of Lake Malawi, one of the deepest lakes in the world. Long isolation has resulted in adaptive radiation and speciation of cichlid fish, with hundreds of species known and many others yet to be described, giving the area a similar importance to the Galapagos Islands and Darwin's finches. All but five of 350 cichlid fish known from the lake are found nowhere else.[101] *The site is of enormous importance although it is currently too small (only 0.02% of the whole lake and many species exist outside the protected area) and threatened by poaching, boat pollution and siltation from the deforested hills surrounding the area, along with the threat of deliberate introduction of non-native fish species.*[102]

The park is listed as category II and clearly contributes to the 30x30 target. However, category II protected areas are supposed to represent ecosystems and the current protected area is clearly too small to do this effectively, suggesting that an expansion, possibly through an OECM is needed, along with greater cross border cooperation with Tanzania and Mozambique.



Gachedili Canyon Natural Monument, Georgia

Name	*Gachedili Canyon Natural Monument (Georgia)*			
Designation type / protective mechanism	*Protected area, IUCN category III*	*PA*	*OECM*	*30x30*
Designation status	*Designated as a natural monument, 2013.*			
Primary aim	*The main aim is to preserve the physical character and integrity of an erosion canyon and associated caverns on the Abasha River.*			
Governance type	*National ministry.*			

The site is a typical category III natural monument, small in size (1.68km^2)[103] and protected due to a series of dramatic physical features; the site is famous for the deep blue green water.[104] Until recently scarcely known outside the region, after designation the site became a magnet for tourists and suffered overcrowding; there were several accidents. Visitor numbers are now limited; there are three viewing platforms and a boat trip along several hundred metres of the canyon. Although the site is primarily aimed at preserving a particular geography, it contains important biodiversity and a cave-dwelling leech new to science was reported from there in 2021.[105]

Category III is complex, in that it is often based on a physical feature or a sacred natural site, and geology is a stronger driver than biodiversity. But under the IUCN definition, all protected areas should be prioritising nature conservation and therefore this fits within the remit of the target.

Laguna Torca, Chile

Name	*Laguna Torca, Chile*			
Designation type / protective mechanism	*IUCN Management Category IV, KBA (2010), IBA (2019)[106]*	*PA*	*OECM*	*30x30*
Designation status	*Designated 1975, expanded 1986[107]*			
Primary aim	*Nature conservation and research[108]*			
Governance type	*Federal or national ministry or agency and managed by Corporación Nacional Forestal (CONAF)*			

*The 604-hectare Laguna Torca reserve is located in a lacustrine system made up of several lagoons on Chile's coast, South of Santiago. This site is a KBA and an IBA. It provides habitat for high densities of over 90 species of birds, including the swamp crow and the coscoroba swan (*Coscoroba coscoroba*), along with the coypu (*Myocastor coypus*), the culpeo fox (*Lycalopex culpaeus*) and the lesser grison (*Galictis cuja*).[109] BirdLife International reports this site's threat score to be very high, condition to be favourable and conservation action to be medium. It is unknown if the site is managed for aquatic species at this time.*

This site is a protected area with important biodiversity values and effective protection; therefore it should contribute to 30x30.

Zones humides de l'Onilahy, Madagascar

Name	*Zones humides de l'Onilahy (Madagascar)*			
Designation type / protective mechanism	*Protected area, IUCN category V, Ramsar Site*	*PA*	*OECM*	*30x30*
Designation status	*2017*			
Primary aim	*The national park was established to preserve the endemic species and high ecological value of the river, in collaboration with local communities.*			
Governance type	*Run through collaboration between communities and WWF, an NGO*			

The Ramsar site covers a 75-km stretch of the lower Onilahy River, along with adjacent valleys, rivers, lakes, marshes, swamps and gallery forests on each side of the river. It is located inside the Amoron'I Onilahy protected area, a community run protected area, in south-west Madagascar. The site has a high level of endemism of flora and fauna with 56 reptile species including crocodiles, amphibians and two species of freshwater turtles and the recently identified toadfish Allenbatrachus meridionalis. *The wetlands are threatened by the expansion of agriculture and by upstream charcoal production, which promotes erosion. WWF supported the establishment of the protected area and has helped local resource-dependent communities identify alternative sustainable livelihoods.*[110]

The park is category V, which in Madagascar has a more precise meaning than elsewhere, involving a high level of cultural integration and collaborative approaches to nature conservation. It definitely counts towards 30x30.[111]

Pacaya-Samiria, Peru

Name	*Pacaya-Samiria, Peru*			
Designation type / protective mechanism	*Seasonal wetland and floodplain reserve, National reserve, IUCN management category VI, Ramsar site*[112]	*PA*	*OECM*	*30x30*
Designation status	*Reserve established 1972*			
Primary aim	*Originally to protect the Arapaima gigas fish*[113]			
Governance type	*National government (Ministry of the Environment) through the National Service of Natural Protected Areas (SERNANP)*			

The two large river basins of the two-million-hectare Pacaya-Samiria reserve form a vast complex of permanent freshwater lakes, lagoons, and seasonally flooded, tropical forested wetlands.[114] *The management objective of the area is to 'conserve representative ecosystems of the lowland forest of the Amazon in Peru and preserve its genetic diversity. This includes flora and fauna species, many of which have disappeared (giant otter, Arapaima. The area is home to significant freshwater biodiversity including two dolphin species, manatee, freshwater turtles and fish. Historically, the reserve has not considered the river as included within the boundaries nor have freshwater management objectives been included. The floodplain wetlands provide an important service in flood management and prevention for the more than 120,000 people living in settlements within and surrounding the Reserve.*[115] *This service may be especially important in years to come as climate change increases the level of flooding in the area.*[116] *The reserve has also been consistently identified as providing important water provision services.*[117]

Gayini Nimmie-Caira IPA, Australia

Name	*Gayini Nimmie-Caira IPA, Australia*			
Designation type / protective mechanism	*Potential Indigenous Protected Area*	*PA*	*OECM*	*30x30*
Designation status	*In development*			
Primary aim	*Restore water table and delivery of water to ecologically valuable ecosystems*			
Governance type	*Indigenous Peoples*			

The Lowbidgee is the largest remaining area of wetlands in the Murrumbidgee Valley. It has also been home to more than 40 First Nations over tens of thousands of years. But since the late 1800's surface water extraction and periods of drought have significantly impacted the environment.

In 2011-2012, the Gayini Nimmie-Caira water-recovery project was initiated purchasing 84,417 hectares of land over 19 properties and their associated water rights and transferring these rights to the Nari Nari Tribal Council. The council now manages these lands with a number of consortium partners, restoring the water table and enhancing delivery of water to ecologically valuable areas in the Lowbidgee under an environmental water plan.[118] These actions have resulted in large scale restoration and effective, long-term conservation, the Council has not yet established this as a protected area or OECM. If they do, given a demonstration of effective-long term conservation, it would contribute to 30x30.

Ivindo River WHS, Gabon

Name	*Ivindo River World Heritage Site, Gabon*			
Designation type / protective mechanism	*World Heritage Site, IUCN Category II*	*PA*	*OECM*	*30x30*
Designation status	*Given World Heritage status in 2021, national park established in 2002[119]*			
Primary aim	*To protect important habitat for endemism, speciation and threatened species*			
Governance type	*Federal or national ministry or agency*			

Ivindo River World Heritage Site and Ivindo National Park encompasses 300,000 hectares of forests crossed by a network of blackwater rivers and wetland clearings, feeding the mainstem Ivindo River. The mainstem river includes a series of iconic waterfalls and pools. The falls limit species' movement during average and low streamflow conditions, which has generated important sites for fostering speciation of fish and insects.[120] The site's aquatic habitats harbour numerous endemic fish species, 13 of which are threatened and many others are yet to be described.[121] It has also been deemed an important habitat for threatened slender-snouted crocodiles, forest elephant, chimpanzee, western lowland gorilla and three species of pangolin. The Ivindo River flows into the Ogooué River and together, represent one of the few remaining large free-flowing rivers on the continent. Thus, the site meets WHS criteria IX and X. It is noted that Ivindo River World Heritage Site and National Park connect to the downstream Ivindo River Ramsar Site.[122]

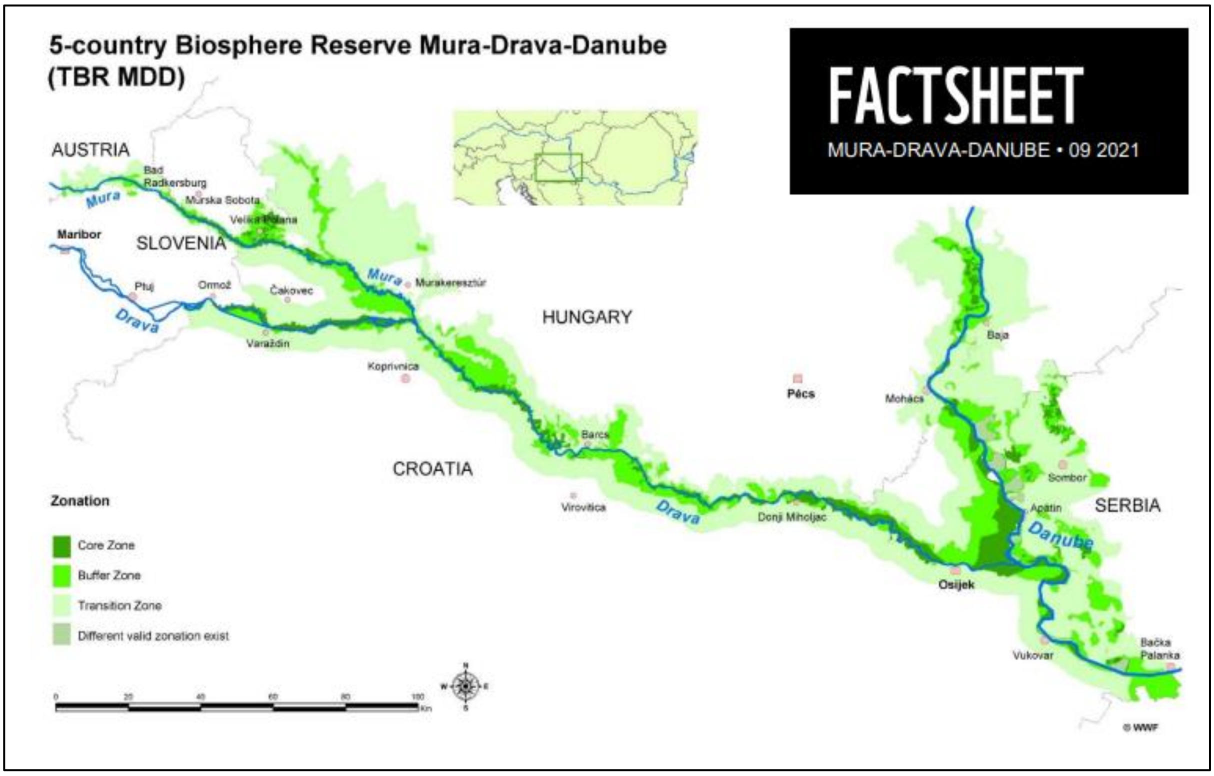
This site is a protected area, it provides ecosystem services for local communities including water purification and regulation,[123] is resulting in effective, long-term conservation and contributes to 30x30.

Mura River Biosphere Reserve, Slovenia

Name	*Mura River Biosphere Reserve, Slovenia*			
Designation type / protective mechanism	*Biosphere Reserve, Natura 2000*	*PA*	*OECM*	*30x30*
Designation status	*Designated 2018*			
Primary aim	*To support a green and sustainable future that balances both economic and conservation goals*			
Governance type	*Mixed*			

The Mura is the last large free-flowing river in Slovenia. Its Biosphere Reserve encompasses Slovenia's largest preserved floodplain complex and,[124] together with the Danube and Drava rivers in Austria, Croatia, Hungary, Slovenia and Serbia, makes up one large UNESCO Trans-Boundary Biosphere Reserve encompassing an area often referred to as "the Amazon of Europe". The Mura River has the highest fish biodiversity in all of Slovenia, 70 per cent of which are threatened, and provides high quality drinking water for 57 000 people.[125]

The 16,298-hectare core and buffer zones are a legally protected area and the 12,354-hectare transition zone is an area for sustainable resource management, equivalent to an OECM.[126] Thus the entire 26, 652-hectare area can contribute towards 30x30.



Natural Hydrological / Fluvial Reserves, Spain

Name	*Natural Hydrological / Fluvial Reserves, Spain*			
Designation type / protective mechanism	*Natural Hydrological / Fluvial Reserve*	*PA*	*OECM*	*30x30*
Designation status	*135 registered*			
Primary aim	*Protect the biodiversity and social values of water bodies in their natural state from hydropower and water use development*			
Governance type	*State??*			

Fluvial reserves were first introduced into Spanish law in 2015 as a way to protect natural water bodies with biodiversity and social values from development for hydropower and water supplies, and since then 135 reserves have been established, all in headwater reaches.[127] Whilst there are some lake and groundwater reserves, most reserves cover linear sections of rivers, riverines, creeks and glaciers. The designation of such reserves requires the cooperation of the water authorities (abstraction, hydropower and flood control) and therefore prohibits and protects against major water infrastructure development within the reserve.[128] Natural hydrological or fluvial reserves are established for the protection of natural flow and hydro-morphological characteristic; some may offer protection to biodiversity but no management plan for this purpose is required. Some may be considered protected areas and others more naturally fall into the OECM category, it is likely that many will contribute to 30x30.

Upper Yangtze Fish Reserve, China

Name	*Upper Yangtze National Nature Reserve for Rare and Endangered Fish, China*			
Designation type / protective mechanism	*Species-specific reserves*	*PA*	*OECM*	*30x30*
Designation status	*National reserve status since 2000*			
Primary aim	*Protect species richness and mitigate ecological impacts of the Three Gorges Dam upstream*			
Governance type	*Ministry of Environmental Protection*			

The Fish Reserve provides protection for three rare fish (Chinese paddlefish, Dabry's sturgeon, and Chinese high fin banded shark) and dozens of endemic fish, primarily from hydropower which is restricted within the reserve. Some accommodations were made early after reserve establishment to excise areas for dam developments planned for many years. However, the reserve did effectively protect against the Xiananhai Dam which would have bisected the range of migratory fish species and severely affected fish spawning.[129] As a reserve dedicated to the protection of fish diversity and endemism this area is the equivalent of a protected area and contributes to 30x30.

Kadwa Kosi Floodplains, India

Name	*Kadwa Kosi Floodplains, India*			
Designation type / protective mechanism	*Seasonal floodplain and wetland*	*PA*	*OECM*	*30x30*
Designation status	*The community land owners have yet to consent to the official recognition of this site as a PA or OECM.*			
Primary aim	*Bird tourism*			
Governance type	*Local communities and elected members of the local village council. Managed by Mandar Nature Club (local NGO), Bhagalpur Forest Division (Department of Environment, Forest and Climate Change), and the local village council and individuals.*			

The Kosi river and floodplains are a 1,600-hectare community conserved area that function as a breeding and foraging ground for the globally threatened Greater Adjutant Stork. The wetlands also provide habitat for the black-necked stork, Asian woollyneck, lesser adjutant stork, and painted stork. Other key fauna includes the endangered Gangetic dolphin, Indian monitor lizard, nilgai, wild boar, jackal, Indian grey mongoose, and species of turtles and snakes. There are also some large tree species and fruit orchards.[130] *The site provides a perfect ground for bird tourism and each year many naturalists and ornithologists from India and abroad visit the breeding sites of the Greater Adjutants and interact with the local community involved in bird conservation.*[131]

This site is not officially a protected area, its aim is sustainable tourism through the bird breeding grounds, yet it is delivering effective conservation. Should the community land owners wish to recognise this as a protected area, they could. For now, it should be considered equivalent to an OECM and does contribute to 30x30.

Rights of Rivers, Rio Atrato, Colombia

Name	*Rights of Rivers, Rio Atrato, Colombia*			
Designation type / protective mechanism	*Rights of Nature / Rights of Rivers*	*PA*	*OECM*	*30x30*
Designation status	*Rights granted in 2016*			
Primary aim	*Protect the rights of the river from infrastructure development*			
Governance type	*Afro-Colombian and Indigenous communities of the Atrato supported by NGOs*			

In 2016, the Atrato river basin and its tributaries were granted legal personhood by the Colombian Constitutional Court with rights to protection, conservation and restoration.[132] *This was in response to local Indigenous and Afro-Colombian communities that had filed a petition for guardianship of the river arguing that illegal mining was violating their right to a healthy environment, that they are interrelated with nature and that you cannot separate their rights to a healthy river from the well-being of nature itself.*[133] *The case set a legal precedent for the granting of rights to many other rivers globally and the Atrato ecosystem now represents the only break in the Pan-American highway, intended to connect Canada with Argentina.*[134]

In theory, this designation should contribute to 30x30. However, communities of the Atrato have since faced numerous challenges including a lack of financial and political support and these legal designations have not proved adequate for them to defend against these interests.

Paruku, Western Australia

Name	*Paruku, Western Australia*			
Designation type / protective mechanism	*ICCA / IPA; around the lakes and wetlands is an IUCN management category II and the surrounding area is VI*[135]	*PA*	*OECM*	*30x30*
Designation status	*Indigenous Protected Area title was recognised in 2001*			
Primary aim	*To protect local environmental and cultural values*			
Governance type	*The land belongs to the Walmajarri people and decisions are made by a Steering Committee of sixteen elders, working with the technical and financial support of the government*			

Paruku is an Indigenous Protected Area (IPA) encompassing a huge wetland on the edge of the Great Sandy and Tanami deserts, in Western Australia. The Walmajarri believe their people were created by a star falling into the lakes and transforming itself into a man, becoming the very first Traditional Owner of Paruku.[136] *The lakes are the endpoint of many "Dreaming tracks" giving them great cultural importance to the aboriginal peoples. The lakes support at least 73 species of waterbird and 175 species of aquatic invertebrates. They provide a stopover for 16 species of migrant shorebirds and, during droughts, a major refuge and breeding pool for waterbirdsamd are recognised as an Important Bird Area.*[137]

Prior to 2001, tourists were free to visit the area unmanaged and unmonitored, this along with unregulated cattle damaging wetlands and nesting birds created some serious environmental impacts.[138] *Having declared Paruku as an IPA, the Traditional Owners can now regulate cattle and manage visitors through a permit system and education on minimizing their impact and respecting local environmental and cultural values.*[139]

The Paruku IPA is being protected for its conservation values, is a PA and contributes to 30x30.

Great Bear Rainforest, Canada

Name	*Great Bear Rainforest, Canada*			
Designation type / protective mechanism	*British Columbia Conservancy and Indigenous Protected and Conserved Areas*	*PA*	*OECM*	*30x30*
Designation status	*Protected areas established 2009*			
Primary aim	*Protect and sustainably manage the forests and coastal waters in First Nations Territories*			
Governance type	*Co-management between Indigenous peoples and the Province*			

In 2009, First Nations and the Province agreed to the protection (5 million acres) and sustainable management (14 million acres) in the Great Bear Rainforest, an area with rare and important free-flowing rivers from a region that sustains a significant portion of the world's wild salmon. This partnership resulted in the Great Bear Rainforest Agreement, which was signed between First Nations and the British Columbia government in 2016.[140] *Here, the First Nations implement Ecosystem Based Management, promoting human well-being and ecology,*[141] *and have led 291 scientific research or habitat restoration initiatives, several of which were focused on salmon.*[142] *The Land Use Order and Forest Management Act are conserving 85% of the forest and 70% of old growth*[143] *through the sustainable management and increasing First Nation management authority. Whilst sustainable management is important for biodiversity, OECMs are not multi-use production zones, so this portion of the site is unlikely to qualify as an OECM.*

Rwenzori Mountains National Park, Uganda

Name	*Rwenzori Mountains National Park, Uganda*			
Designation type / protective mechanism	*Source water protection area, national park (IUCN category Ib), World Heritage Site (VII and X), Ramsar site*	*PA*	*OECM*	*30x30*
Designation status	*National park established 1993*			
Primary aim	*To protect a vital water catchment for drinking, irrigation, hydropower and a source of fish and cultural-political value in provisioning water to the Nile*			
Governance type	*Government-owned and managed by the Ugandan Wildlife Authority (UWA)*			

The Rwenzori Mountains National Park covers nearly 100,000 ha and comprises the main part of the Rwenzori mountain chain. The Rwenzori's extensive upland bogs act as a huge sponge absorbing and regulating the rainfall, constituting a vital water catchment.[144] Its glaciers, waterfalls, lakes are the highest and most permanent source of water for the River Nile and the biggest contributor of water in the region for domestic and industrial use.[145] These waters supply 500,000 Ugandans with flood protection; water for drinking, irrigation and hydropower; and inflow to the fisheries of Lakes Rutanzige and George. The area is also designated one of WWF's Global 200 Freshwater Ecoregions. The park's long history of protection as a vital water catchment area has contributed to the protection of this site from external threats. However, there are concerns that the potential reopening of a copper mine located adjacent to the park may create water pollution and damage the park's rich aquatic biodiversity including endemic species of fish that are sensitive to water pollution.[146]

As a national park this is a protected area and contributes to 30x30.

Mawas peatlands project, Central Kalimantan, Indonesia

Name	*Mawas peatlands project, Central Kalimantan, Indonesia*			
Designation type / protective mechanism	*Carbon capture area, not a protected area*	*PA*	*OECM*	*30x30*
Designation status	*REDD+ project established in 2003 (ongoing)*			
Primary aim	*Carbon storage and reduced emissions from degradation and deforestation*			
Governance type	*Borneo Orangutan Survival Foundation manage the project*			

The 309,000-hectare Mawas peatland in Central Kalimantan stores giga-tonnes of sequestered carbon.[147] Over a period of 8,000 years, decaying plant matter from the swamp forests has built up 13 to 15 meters high domes of peat. The peat swamp forest in this area was once drained under the government Mega Rice Project, which aimed to open up vast agricultural areas to fulfil the demand for rice. The Mawas Conservation Program has been restoring the area by blocking man-made canals and planting endemic trees, reducing the risk of flooding and forest fires which would release the peatland carbon stores into the atmosphere.[148] By the end of its REDD+ project life (2003-2032) the area expected to have prevented the emissions of over 125 million tCO2 equivalent.[149] The Mawas peatland also sustains one of the largest remaining orangutan populations with an estimated 2,550 orangutans inhabiting the area.[150]

The area seems likely to contribute to 30x30.

Mae Ngao Community Fish Reserve Network, Thailand

Name	*Mae Ngao Community Fish Reserve, Thailand*			
Designation type / protective mechanism	*Fisheries Reserve*	*PA*	*OECM*	*30x30*
Designation status	*Established and expanding*			
Primary aim	*Augmenting fisheries*			
Governance type	*Mae Ngao Communities*			

Over the last three decades Indigenous P'ganyaw (Karen) communities along the Mae Ngao River have established a network of more than 50 no-take river reserves ranging between 0.2 and 2 km long. The communities were unified in their opposition to a national park designation, clear that their primary goal was the maintenance and augmentation of fish stocks.[151] *As conservation is a secondary goal, the reserves can be considered equivalent to an OECM.*

Communities delineate the boundaries, develop and enforce penalties for noncompliance and some cases sell licenses for catch and release angling. Relative to non-protected sites, the reserves contain ~27 per cent more fish species, 124 per cent higher fish density, and 2,247 per cent more fish biomass.[152] *This suggests networks of small, community no-take reserves offer a model for protecting biodiversity and augmenting fisheries and can contribute to 30x30.*

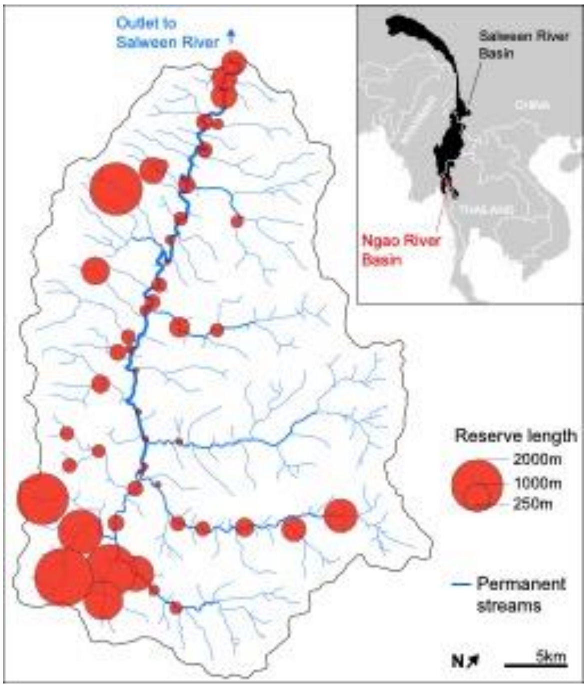


Photo below: Ngao River © Aaron Koning.

Riparian zones, Mongolia

Name	*Mongolia riparian zones*			
Designation type / protective mechanism	*Riparian protection strips*	*PA*	*OECM*	*30x30*
Designation status	*Approved in 2020: millions of hectares of riparian and adjacent areas now considered nationally protected*			
Primary aim	*To protect water basins from the negative effects of mining and infrastructure*			
Governance type	*Government*			

The impacts of mining and overgrazing on Mongolia's freshwater ecosystems were exacerbated by climate change causing a decade-long drought up to 2015. In 2009 the government made mining in protected water zones illegal. This law was refined in 2012, differentiating ordinary from special (stricter) protection areas. The ordinary protection zone prohibits tree cutting, construction of buildings without wastewater treatment, storage of petroleum, chemicals, radioactive materials, fertilizers, and pesticides, and discharge of wastes and pollutants within 200m of a water body. The special protection prohibits mineral exploration and mining, gravel or stone mining, any construction of buildings and facilities, agricultural cropping and timber harvest within 50 m of a river, stream, natural spring, or floodplain, or may extend the length of riparian area; and within at least 100 m from a lake or other water bodies.[153] River Basin Organizations were tasked with the monitoring and enforcement of riparian areas for 29 basins across Mongolia.[154]

By 2020, the government had declared 8.2 million hectares of riparian areas as protected zones across 29 river basins chosen for their role in maintaining aquatic habitat, water quality, and connectivity. These contribute to 30x30.

Biloxi Marsh, Louisiana, United States

Name	*Biloxi Marsh, Louisiana, United States*			
Designation type / protective mechanism	*Coastal marshland as storm protection; two protected areas: Biloxi river marshes and coastal preserve (category IV), and Biloxi river (V)[155]*	*PA*	*OECM*	*30x30*
Designation status	*Designated a protected area in 1992*			
Primary aim	*Storm protection*			
Governance type	*State department of conservation*			

Between 1932 and 1990, the 11km stretch of marsh surrounding Lake Borgne and the 16,000-hectare Biloxi Wildlife Management Area, Louisiana, lost over 6,300 hectares to wave induced erosion. In recent years, some parts of the shoreline have receded up to 15 metres, greatly endangering the Wildlife Management Area and posing a risk to the City of New Orleans against storm and hurricane surges.[156] The ecosystem has also suffered significant degradation from the unintended effects of the Mississippi River levees and the Mississippi River Gulf Outlet, which prevented annual over bank flooding.[157] The Biloxi Marsh project focuses on restoration and minimizing shoreline retreat to help protect the Wildlife Management Area and dissipate hurricane surges and waves threatening the New Orleans' newly rebuilt hurricane flood defences.[158]

The area is primarily managed for ecosystem services and biodiversity, if the restoration area is adequately protected, prohibiting any environmentally damaging activities, it is a protected area and contribute to 30x30.

Dyfi floodplain, Wales, UK

Name	*Dyfi Biosphere Reserve, Wales, UK*			
Designation type / protective mechanism	*IUCN Category IV, main area, some also IUCN category V; UNESCO Biosphere Reserve; Ramsar sites two privately protected areas*	*PA*	*OECM*	*30x30*
Designation status	*Various parts declared protected areas at different times (1954, 1976, 1992), 1970 for bird reserve, 1976 for Ramsar,[159] 2009 for UNESCO biosphere status.[160]*			
Primary aim	*The biosphere aims at maintaining the "diversity of its natural beauty, heritage and wildlife, and for its people's efforts to make a positive contribution to a more sustainable world…"[161]*			
Governance type	*Mixed: one state-run PA, two PPAs, state and privately-run forestry and many small upland farms in private ownership.*			

The 840km² biosphere reserve includes 78km² of sea and 762km² of land,[162] encompassing the length of the river, Afon Dyfi, estuary and surrounding hills. There are three core zones. The estuary core zone and much of the buffer zone form a floodplain, kept free of development and able to absorb regular flood events when the river bursts its banks, which happens several times a year,[163] thus preventing downstream flooding. At other times the floodplain is devoted to conservation (a bird reserve) or low-level grazing (cattle and sheep),[164] with some hay production. Tourism is the major source of income in rural areas. Afon Dyfi is a salmon and sea trout river, although both are declining, with salmon "at risk" and sea trout "probably at risk".[165] The area has multiple, often overlapping conservation designations and high wildlife value (it is also a recognised Important Bird Area), along with providing a range of ecosystem services. It therefore meets the criteria for inclusion in 30x30.

Rio Muelas River Reserve, Spain

Name	*Rio Muelas River Reserve (Spain)*[166]			
Designation type / protective mechanism	*River Reserve under the EU Water Framework Directive (key actions include nitrate controls, supplementary measures of pollution control, and restoration).*	*PA*	*OECM*	*30x30*
Designation status	*The WFD was agreed in 2000*			
Primary aim	*The main aim of the WFD is to increase overall water quality in the regions designated under the Directive, particularly with regards to nitrate levels.*			
Governance type	*Tajo River Basin Authority*			

*The River Reserve is 8.39 km long and connects different protected areas in central-western Spain, namely Sierra de Gredos Nature to the north, and Valle del Tietar, thus acting as an ecological corridor. Approximately 7 km of the reserve is outside protected areas. It protects a range of priority species, including brown trout (*Salmo trutta*), otter (*Lutra lutra*), dipper (*Cinclus cinclus*), Iberian painted frog (*Discoglossus galganoi*), southern marbled newt (*Triturus pygmaeus*) etc, plus some priority riparian habitats. The site faces some problems, some illegal hunting, obstacles to water flow, unregulated grazing, livestock pollution and invasive species. Nonetheless, natural values remain largely intact.*

The areas outside the protected areas appear to meet the criteria for an OECM.

Upper Delaware River, United States

Name	*Upper Delaware River*			
Designation type / protective mechanism	*National Wild and Scenic River (US designation) and national park*[167]	*PA*	*OECM*	*30x30*
Designation status	*1978*			
Primary aim	*The Delaware is the longest free flowing river in the United States east of the Mississippi, and the designation aimed to protect the free-flowing quality and its associated values,*			
Governance type	*Governed through cooperation between state and federal governments, through a compact organisation and the National Park Service.*[168] *The small reserved area is reported as being under private ownership and management.*[169]			

*The designation covers 73.4 miles of the river, which is essential for ocean-dwelling migratory fish that spawn in freshwater, such as the American shad (*Alosa sapidissima*) and America eel (*Anguilla rostrata*) as well as the federally endangered dwarf wedge mussel (*Alasmidonta heterodon*). The river supports 45 fish species, is an important source of water and has high recreational values alongside its importance as an unusual example of freshwater integrity. A small part of the area (0.14km^2) is reported as a private reserve IUCN category V.*[170] *The Delaware River Basin Compact provides complementary protection authorities for the environmental flow and water quality of the mainstem river. It was under this authority that fracking was banned in the Delaware River Basin. Although the mainstem is free-flowing, some of the tributaries are dammed and this has impacts on water quality; comparison of dammed and free-flowing tributaries found the former to have disrupted ecology.*[171] *The area appears to meet the requirements of 30x30.*

Laguna Mar Chiquita, Argentina: Western Hemisphere Shorebird Reserve Network

<table>
<tr><td>Name</td><td colspan="4">Laguna Mar Chiquita, Argentina: Western Hemisphere Shorebird Reserve Network (WHSRN)</td></tr>
<tr><td>Designation type / protective mechanism</td><td>"Stepping stones" (stopover sites) for migratory birds; IUCN management category VI,[172] Ramsar site[173]</td><td>PA</td><td>OECM</td><td>30x30</td></tr>
<tr><td>Designation status</td><td colspan="4">Designated as a Multi-Use Provincial Reserve (VI) in 1994</td></tr>
<tr><td>Primary aim</td><td colspan="4">To provide a stepping stone (stopover) habitats for migratory birds</td></tr>
<tr><td>Governance type</td><td colspan="4">Provincial government</td></tr>
<tr><td colspan="5">The WHSRN is made up of 15.7 million hectares across 114 sites in 18 participating countries in North and South America.[174] The WHSRN represents some of the most important habitat and stopover sites for shorebirds and migratory birds in the Americas. WHSRN relies on in-country partners to ensure the relevant conservation for the sites.

Many sites are inland waters such as Laguna Mar Chiquita, South America's largest lake,[175] a huge, permanent, saline lagoon up to 4 meters deep, edged by brackish that provide habitat for dozens of bird species.[176] Laguna Mar Chiquita has been listed as a VI protected reserve since 1994, but many stopover sites world-wide that are currently not actively protected, but are delivering effective long-term conservation, would be ideal places to prioritize for PA or OECM designation and contribution to 30x30 targets.</td></tr>
</table>

Onon River, Mongolia

<table>
<tr><td>Name</td><td colspan="4">Onon River, Mongolia</td></tr>
<tr><td>Designation type / protective mechanism</td><td>Recreational fishing river, Onon Balj National Park (II)[177] protects some of the river basin</td><td>PA</td><td>OECM</td><td>30x30</td></tr>
<tr><td>Designation status</td><td colspan="4">Onon Balj National Park (II) established in 2000, expanded in 2020</td></tr>
<tr><td>Primary aim</td><td colspan="4">Multiple land uses, outside of the national park the primary uses are the supply of water for communities and fly fishing for tourism</td></tr>
<tr><td>Governance type</td><td colspan="4">Mixed; the national park is managed by the Ministry of Environment and Tourism</td></tr>
<tr><td colspan="5">The Onon River is the historical birthplace of Chinggis Khan, it is also one of just two sources of the Amur River – the ninth-longest free-flowing river in the world, supporting millions of people across Mongolia, China, and Russia.[178] Fly fishing is a significant source of income for rural communities.[179]

In 2017, the government abolished the "U and B", gold mining company's Onon River license after the company polluted the river and changed the river flow direction without authorization.[180] In 2020, the government officially designated large swaths of the Onon river watershed for protection by expanding the Onon Balj National Park.[181] The protection prevents future mines, dams, and other development that would pollute, fragment, and alter the natural flow of nutrients and resources throughout the region.[182]

Whilst the rest of the Onon River is not necessarily formally protected, its value for fishing and culture have protected it against some threats. Thus, this basin could be considered equivalent to an OECM and contributing to 30x30.</td></tr>
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Parker River National Wildlife Refuge, United States

Name	*Parker River National Wildlife Refuge, USA*			
Designation type / protective mechanism	*Wetland/game hunting reserve; IUCN Management Category IV*[183]	*PA*	*OECM*	*30x30*
Designation status	*Designated a protected area in 1941*			
Primary aim	*Biodiversity conservation and recreation through hunting*			
Governance type	*Federal or national ministry or agency*			

This 1,900-hectare reserve is located along the northeast coast of Massachusetts in an area of dense and expanding human development. The site encompasses a diverse wetland ecosystem of cranberry bogs, man-made impoundments, salt marsh and associated creek, river, and mud flats. These habitats support more than 300 species of resident and migratory birds, including the federally threatened piping plover.[184] *Hunting at Parker River National Wildlife Refuge represents both a traditional recreational use and serves as an important wildlife management tool.*[185] *All hunters are required to adhere to state and federal regulations.*[186,187] *The refuge also provides opportunities for walking, biking, wildlife photography and fishing.*

This site is a protected area and contributes to 30x30.

North Creek Wetland, Colonel Samuel Smith Park, Canada

Name	*North Creek Wetland, Colonel Samuel Smith Park, Canada*			
Designation type / protective mechanism	*Artificial recreational lake*	*PA*	*OECM*	*30x30*
Designation status	*Established as a park since 1980*			
Primary aim	*Recreational*			
Governance type	*State; owned and governed by the Toronto and Region Conservation Authority; managed by City of Toronto Parks, Forestry and Recreation Department*			

Colonel Samuel Smith Park is a remnant of the Crown Lands granted in 1793 to Colonel Samuel Smith of the Queen's Rangers, it includes part of the grounds of the former Lakeshore Psychiatric Hospital, which operated from 1889 to 1979. The park also encompasses the 36-hectare North Creek Wetland which was excavated by the hospital's patients during this period.[188] *It is now one of a number of shoreline and aquatic habitat restoration projects under the Toronto and Region Conservation Authority's Lake Ontario waterfront programme. The park is also a designated Toronto Bird Sanctuary. Recreational and educational services include hiking trails, outdoor skating, beaches, picnic areas, marina services, and fishing.*[189] *The park supports 23 species of fish and 256 species of plants that comprise 39 natural and anthropogenic vegetation communities. The park also provides habitat for 48 breeding vertebrate species and staging habitat for thousands of migrating songbirds and waterfowl.*

This site is not a protected area, conservation is a secondary aim after recreation and thus it is equivalent to an OECM and can contribute towards 30x30.

Isojärvi National Park, Finland

Name	*Isojärvi National Park, Finland*			
Designation type / protective mechanism	*Recreational natural lake, National Park (II), Special Protection Area (Birds Directive)*[190]	*PA*	*OECM*	*30x30*
Designation status	*Designated as a protected area in 1998*			
Primary aim	*Recreation and conservation*			
Governance type	*Federal or national ministry or agency*			

Finland's Lakeland has 17 lakes where canoeing and boating are allowable recreational activities.[191] *Isojärvi National Park is one such area, an old logging site with a range of activities on offer from hiking and canoeing to enjoying the views.*[192] *Isojärvi is a clear-water lake formed at the bottom of a ravine, its deepest point is more than 70 meters, it is 20 kilometres long and as narrow as a fjord in places, making it ideal for exploring the lake edges in a canoe. There are also two rowing boats for rent in Kalalahti bay. In addition to canoeing and boating, visitors to the park can swim in the lakes and enjoy hook and line and ice fishing.*[193]

As a national park, Isojärvi is providing effective, long-term conservation of biodiversity values for the purpose of recreation, therefore the site contributes to 30x30.

Hero River floodplain, Ukraine

Name	*Hero River floodplain, Ukraine*			
Designation type / protective mechanism	*Potential "Hero River"; Military buffer zone*	*PA*	*OECM*	*30x30*
Designation status	*Uncertain, reflooded February 2022*			
Primary aim	*To act as a buffer for the city of Kyiv to invasions*			
Governance type	*Uncertain*			

During the 2022 Russian invasion of Ukraine, the breaching of the Irpin dam at the end of February held back advancing Russian soldiers and tanks, and reflooded 13,000 hectares of wetlands that were drained by the Soviets in the 1960s. For its role in protecting the city of Kyiv from multiple invasions, there are calls among cultural leaders for the floodplain to be officially protected as a 'Hero River' along with other natural areas in Ukraine that have helped to protect soldiers and civilians in the war effort.[194]

The Hero River fringes the Polissia region; one of Europe's largest contiguous wetland and woodland areas; consisting of a dozen Ramsar sites and many protected areas that run along the northern border of the country. Before it was drained, the floodplain was a vast biodiversity hotspot composed of bogs, swamps and marshes providing habitat for giant catfish, sturgeon, wetland bird species and birds of prey, like the white-tailed eagle.[195]

Officially protecting this river and floodplain and supporting the area to restore would contribute to the connectivity of these sites and expand Ukraine's impressive wetland environment. Should the Ukrainian government prioritize conservation of the Irpin wetlands after the war, their primary goal may be to ensure the wetlands continue to act as a barrier to Russian aggression. In which case, this area could contribute to 30x30 as an OECM.

Wetlands of the Polissia region. Photo credit: Jody Bragger / [Tellus Reserves]

Mai Pokhari Lake, a sacred site with conservation value, Nepal

Name	*Mai Pokhari Lake, Nepal*	
Designation type / protective mechanism	*Sacred lake, also recognised as a Ramsar site*	PA / OECM / 30x30
Designation status	*Added to the Ramsar list in 2008*	
Designation aims	*Ramsar designation notes the importance of the natural lake as a water source, for supporting significant biodiversity and as a site of spiritual significance to Buddhist, Taoist and Mundhum (animist) faiths.*[196]	
Governance type	*The site is managed by the local community and by religious leaders*	

The 90-ha natural lake is at 2100 metres in Nepal, situated in a community forest area. Mai Pokhai is believed to have been created when nine goddesses descended to Earth and inhabited the nine corners of the lake; any activity impacting the pond and its surrounding forest is thought to bring bad luck. Local people carry out restoration activities, including tree planting, and the lake is also the focus for religious festivals and the Maruni Dance, a traditional dance performed during Deepawali, the light festival. It is part of WWF's "Sacred Landscapes of the Himalayas" initiative.[197] *The site has important levels of support from influential individuals within the community and also has official recognition through the Ramsar listing process. It has been extensively studied in terms of its biological composition.*[198]

Objectives: *the driving force of activity is to maintain the religious significance of the lake and to ensure that the current levels of biodiversity and ecosystem services are maintained. The site is probably a candidate OECM if not a full protected area, and perhaps equivalent to an ICCA; in either case it would count towards the 30x30 target.*

Successes: *the site supports important biodiversity, including its aquatic fauna and species of the surrounding forest including leopard cat and epiphytic orchids.*[199] *The government at one stage developed a tourist enterprise, including boating, which caused disturbance and has now been abandoned following lobbying by the local community.*[200] *Community support remains high.*

Challenges: *The lake has some invasive species, including the gold fish* (Carassius auratus)[201] *and water hyacinth (*Eichhornia crassipes*); the latter infests about a fifth of the lake.*[202] *Work in preparation for ecotourism caused damage to lake vegetation, which is being restored.*[203]*Some pollution is reported.*[204] *Villagers also report that old traditions are dying out and some of the religious significance of the area is in danger of being lost.*

Financial information: *ecotourism income remains trivial,*[205] *the value of the lake in spiritual terms is the main force driving its conservation.*

Lake Tanganyika, fisheries reserve, Tanzania,

Name	*Lake Tanganyika Community Fish Reserves, Tanzania*			
Designation type / protective mechanism	*Fisheries Reserve (only the protected breeding zones and zones prohibiting extractive activities, could qualify as OECMs)*	*PA*	*OECM*	*30x30*
Designation status	*Established*			
Primary aim	*Managing fisheries reserves*			
Governance type	*Communities*			

Several Tanzanian villages have established community-based fisheries management reserves within and along the coast of Lake Tanganyika. This type of designation is not legally binding, however it can effectively create collective management of common pool resources, such as fisheries in the case of Lake Tanganyika. In 2012 The Nature Conservancy (TNC) began its collaboration with authorities from the district level and local communities to set up community-based management of fisheries known as Beach Management Units (BMU). BMUs (and the equivalent in the other three riparian countries) in Lake Tanganyika generally include zones where fishing activities are managed, as well as protection zones that are fish breeding grounds and are off-limits to all extractive activities.

Alongside the BMUs, the reserves contain protected fish breeding zones and areas that are protected from extractive activities. These areas are delivering demonstrable, effective conservation of biodiversity and provisioning services and therefore contribute to 30x30.

***Designation process and key players:** Establishing a BMU in Tanzania first starts with an initiator, such as a community or non-profit organization (e.g., TNC). The initiator notifies the Tanzania Ministry of Livestock and Fisheries about their desire to establish a BMU. Then, the Ministry connects the initiator with the district authority, to make a case on why a BMU should be established in a community. If a community is supportive of establishing a BMU, the community leader brings the case of establishing a BMU to the entire community. Next, the community's leadership puts out a call for members who are interested in being members of the BMU. Once 100 BMU members have been recruited, a democratic election process for electing BMU leadership occurs. The election process typically is repeated every three years and adjacent BMUs sharing common fishing zones can unite to form a BMU network. BMUs define bylaws and create spatial restrictions, such as community fish reserves, that are supported by community and government action.*

***Values:** One of the African Great Lakes, Lake Tanganyika, is the second oldest lake in the world at 12 million years old.[206] It is the second largest lake in the world—by volume (17% of world's freshwater) and depth (1.47km).[207,208] The lake spans across four countries, primarily in Tanzania and the Democratic Republic of Congo, and a small part in Zambia and Burundi. It hosts more than 1,500 fish species, 70% of which are endemic to the lake, 250 of which are cichlid species.*

The health of Lake Tanganyika is also critically tied to the health of the communities that surround it. Lake Tanganyika and its basin harbours important medicinal terrestrial and aquatic plants. Hundreds of thousands of people depend on the lake for water, transportation, medicines, cultural rituals, and food. Lake water is used for households, agriculture, and even drinking water in many areas. The lake spans a large area and is navigated by boats, ships, and ferries. The fish from the lake provide more than 40% of the total animal protein consumed by lakeside communities, and fisheries are one of the top two sources of income for communities living adjacent to the lake.

***Threats:** With an increasing population, there is more pressure to harvest resources, including fisheries, to feed families and more land is being cleared for agriculture. Sediment runoff from land clearance degrades water quality and causes impairments to fish breeding sites. Due to the lack of available latrines, coastal communities defecate in water and around the beach leading to contamination of water and hence degraded lake water* *quality. Climate change also poses a risk as warming of the lake can cause low-oxygen zones, making it less habitable.*

Successes: *To date, 42 BMUs have been established across 85 coastal villages in Tanzania covering 2,700 hectares. The establishment of BMUs was attributed to involvement with the local government from the beginning, persistently raising awareness, and developing a program based on support from an existing law. Similar co-management bodies have been developed on the Zambian side of the lake with Frankfurt Zoological Society (FZS) as the prime initiator. TNC has created a lake-wide network of partners, including FZS, to scale fisheries co-management and reserves in critical habitats around Lake Tanganyika's nearshore.*

Challenges: *Building and keeping capacity remains a major challenge by BMUs and linked reserves, due to new leadership elected every 3 years and the availability of participants of this voluntary program. Another challenge is the lack of sustainable financing to maintain BMUs long-term. The voluntary nature of BMUs does not require the Tanzanian government to fund them. In order to maintain the long-term establishment of BMUs, sustainable funding must be identified.*[209]

Financial information: *BMUs, working with TNC and government, are exploring approaches to make BMUs more financially sustainable while also supporting alternative livelihood options to wild caught fisheries.*

Krupa River – cultural landscape, Croatia

Name	*Krupa River, Croatia*			
Designation type / protective mechanism	*Cultural landscape and Natura 2000*	*PA*	*OECM*	*30x30*
Designation status	*Established (2019)*			
Primary aim	*Preservation from any interventions or developments that would threaten or destroy its values*			
Governance type	*Ministry of Culture (country-level)*			

***Designation process and key players**: In 2019, after nearly two decades of advocacy, lobbying, and the hard work of community members and conservation organizations, the Krupa River was protected through designation as a cultural heritage. The Ministry of Culture used relevant legislation and noted that the Krupa River is a unique natural and cultural heritage.[210] This marked the first river in Croatia to be protected based on cultural significance and one of few in Europe.*

Cultural heritage areas protect natural and cultural heritages and are protected from development.

***Values:** A little less than 11 km in length,[211] the Krupa River is a unique karst river, shaped by soft rocks that dissolve in water. The Krupa River is located at the foot of the Velebit Mountains in Zadar County near the village of Krupa.[212] This scenic landscape cuts through a deep canyon—up to 300 m—where it meets the Zrmanja River and eventually flows into the Adriatic Sea. The Krupa River is home to eight fish species, including three that are endemic to the Zrmanja River Basin and also hosts the globally threatened European eel. Within Croatia, It is also a rare location of tufa formations, a porous calcium carbonate deposit, which creates 19 waterfalls. Historically, horses and donkeys were used to get to the river. The people of Krupa live above the canyon and agricultural fields are found along the river. To this day, only one road to the Krupa River exists that leads to a 14th century Orthodox monastery. The Krupa River holds social and religious significance for the community*

***Threats/ Challenges:** Based on its sheer natural beauty and cultural significance, the desire to protect the Krupa River began to take shape in the early 2000s. In 2001 there was a plan for developing hydropower plants in Krupa and was stopped by a county employee. In 2016, another development plan for Croatia was issued, which again included damming the Krupa River. The plan proposed two dams on the Krupa River, accompanied by reservoirs, pipes, and roads. With the effort of local and international organizations, visibility was brought to protecting the Krupa River by using social media, lobbying members of the government, and advocacy combined with proposed alternative options for meeting energy needs through solar and wind energy.*

The Krupa River protection success story also sheds light on the importance of how to work with different levels of government. While it may vary country to country, in the case of the Krupa River, it was more effective to start lobbying members of the local government first, rather than starting at a high level. It also shows the power of advocacy of community members and organizations.

***Successes:** The designation of the Krupa River as a cultural heritage protects the Krupa River and its landscape from development projects, including hydropower plants. Due to this protection mechanism and no foreseen threats to the Krupa River, the cultural heritage designation is considered durable.*

***Financial Information:** Staff salaries came from county and state budgets, but there have been no special provision for management and maintenance, or to promote the site; further funds are needed in the future to fill this gap.*

National Wild and Scenic Rivers System – United States

Name	*National Wild and Scenic Rivers System (United States)*[213]			
Designation type / protective mechanism	*River-specific policy* *National river protection designation*	*PA*	*OECM*	*30x30*
Designation status	*Federal law passed in 1968*			
Primary aim	*To designate, protect and enhance the free-flowing condition, water quality and outstandingly remarkable values of select rivers and streams.*			
Governance type	Federal, Tribal, state and local entities. Plus, community-partnerships as management model.			

The United States Wild and Scenic Rivers Act (WSRA) was signed into law in 1968 to protect the free-flowing condition, water quality, and other unique values of select rivers and streams.[214] *Similar systems are in place in several other countries. The WSRA sets out criteria to classify, designate and protect river segments from harmful impacts of hydropower construction and other resource projects. The National Wild and Scenic Rivers System includes 226 designated river segments covering 13,400 river miles in 41 states and Puerto Rico (last updated 2019).*[215]

As one example, a 20.5-mile river segment of Clarks Fork River was designated a "wild river area" in 1990 to protect its unique scenic, recreational and historical values.[216] *Clarks Fork is a tributary of the Yellowstone River that flows through the Shoshone National Forest from Crandall Creek Bridge to Clarks Fork Canyon in Wyoming. The canyon offers stunning scenery including soaring cliffs, deep gorges and dramatic waterfalls. Biodiversity in the region is of regional and national importance, and whitewater rapids and fishing provide recreational opportunities. Indigenous Peoples travelled the area on route to buffalo hunting grounds of the Great Plains.*

The 'wild river' designation has served to permanently protect a segment of the Clarks Fork and its surroundings from the impacts of hydropower dams and other development. This example is considered a protected area (IUCN management category V) contributing to 30x30.[217] *However, given WSRA's tiered approach (described below), not all designated segments are well preserved. On a global scale, river-specific designations do not necessarily provide effective protection when upstream or downstream activities have impacts outside the designated area.*[218]

Objectives: *A Wild and Scenic River designation aims to protect and enhance the free-flowing nature of rivers as well as their ecosystem services, which the WSRA labels "outstandingly remarkable values" in perpetuity. Assessed on a case-by-case basis for regional and national significance, these values can include unique scenic and recreational opportunities, geology, fish and wildlife habitat, water quality, historical and cultural heritage, as well as other emerging conservation priorities such as refugia. The designation and subsequent Comprehensive River Management Plan determines appropriate levels of access by community members and visitors to maintain the conservation objectives. Up to a quarter-mile protected buffer zone on either side of a designated river is also given protection.*

Designation process: *Within the National Scenic Rivers System, sections of rivers are classified within a tiered system as either wild, scenic, or recreational river areas. The three designation types allow for different objectives regarding levels of development activity and access.*[219] *For a "wild river" designation, segments must be pristine, free of impoundments, and largely inaccessible, except by trail. "Scenic rivers" must also be free of impoundments and largely undeveloped but can have road access. In contrast, "recreational rivers" may have shoreline development, previous impoundments, and more access.*

In this tiered approach, the objective is not to prohibit the use of a river area, but to protect and enhance its core values and character. Once identified, the suitability of a river segment for protection is assessed. River corridor boundaries are then defined, and a comprehensive river management plan is developed through collaborative engagement with the community and conservation partners.

Pressures and threats: *Prior to being designated, states like Wyoming were proposing to build dams and reservoirs for hydropower and irrigation. While the licensing of any new hydropower dams is prohibited under a WSRA designation, ongoing threats to Wild and Scenic rivers in general include evolving climate conditions, overuse, in-stream developments, and project proposals with the potential to impair values*

Key players: *Rivers segments can be administered by either federal, state, or Tribal agencies. Four federal agencies – the United States Forest Service, National Park Service, Bureau of Land Management, and United States Fish and Wildlife Service – are responsible for overseeing the WSRA. The U.S. Department of Agriculture Forest Service is the designated management authority for the Clarks Fork. Other than when a designated river flows on federal land, states generally administer land management. Several states have passed their own wild and scenic river statutes to bolster protections and reach. Coalitions of land owners, non-profits and community-based groups work in partnership with municipal, state, and federal governments to identify and manage Wild and Scenic Rivers.*

Successes: *On a national scale, the WSRA designation process has aimed to safeguard the unique character of rivers while balancing development needs. The process has engaged communities and the public in collaborative approaches to river management. In the case of Clarks Fork, the designation mitigated the threat of dams and other diversions. While the terrain of the Clarks Fork Canyon would have made widespread commercial development challenging, it was the legal designation that guaranteed that the entrance to Yellowstone would remain wild and scenic.*[220]

Challenges: *The Nationwide Rivers Inventory lists over 3,200 free-flowing river segments considered to have one or more "outstandingly remarkable values" of regional significance, meaning there are many potential candidates not yet afforded protection.*[221] *Because in many cases only sections of rivers are protected, upstream or downstream activities can significantly impact the health of a river. Conflicts arise between private land users, state laws, and federal objectives.*

Financial information: *For Wild and Scenic Rivers on federal lands, the US Congress funds operations and maintenance through annual budgets allocated to federal agencies noted above.*[222] *Agencies may also provide separate funding for rivers of particular interest. State nominated rivers contribute their own funds as they do not receive federal funding. Community-partnerships are allocated funds through the National Park Service and have been a useful model both in terms of engagement as well as where government resources are limited.*

Bita River, Colombia

Name	*Bita River Basin Wetlands Complex (Colombia)*			
Designation type / protective mechanism	*Ramsar Site* *Wetland of International Importance*	*PA*	*OECM*	*30x30*
Designation status	*2018*			
Primary aim	*Explicitly protect an entire riverine system, maintain its free-flowing status, and preserve biodiversity and ecosystem services*			
Governance type	Government agencies and civil society			

As a tributary of the Orinoco River originating in Colombia's Llanos high plains, the Bita River meanders for 510 km within a watershed of 825,000 hectares.[223] The Bita River basin is recognized as a high priority area for conservation due to its rich biodiversity and relatively good conservation condition.[224] After extensive engagement and analysis, the Bita River Basin Wetlands Complex was added to the Ramsar List of Wetlands of International Importance in 2018. It is the largest Ramsar site in Colombia, and globally one of the first to explicitly protect an entire free-flowing river basin, including the mainstem and contributing catchments.[225]

The government of Colombia considers the Bita River Ramsar site one of its "complementary conservation strategies" (CCSs), which are an OECM equivalent contributing to 30x30.[226,227] Note this treatment differs from other countries where Ramsar sites are considered protected areas. Colombian CCSs aim to deliver on biodiversity conservation objectives by contributing to the connectivity of the National System of Protected Areas (SINAP), and in allowing for diverse local and regional governance systems across the country.[228]

***Objectives:** Analyses funded through the Tropical Forest Conservation Act identified the Bita River to be important for conservation. Conservation values include biodiversity, forest and wetland habitat, culture, community livelihoods reliant on tourism and recreational activities, like bird watching and fishing.[229] Connectivity is critical to the movement of the Bita river's freshwater species such as migratory fish, turtles, crocodiles, river dolphins, jaguars, tapirs and otters, among many other species. Biodiversity conservation, sustainable resource use, connectivity, and integrated basin management are key objectives.*

***Designation and management:** An assessment of the costs and benefits of alternative river protection mechanisms was conducted using biological surveys, gap analysis, as well as participatory system dynamics modelling and scenario building. Analyses led to recommendations for a Ramsar designation, a tiered conservation approach (i.e., conservation, restoration, production zones),[230] and development of management plans, conservation agreements and private reserves to balance conservation with sustainable use.*

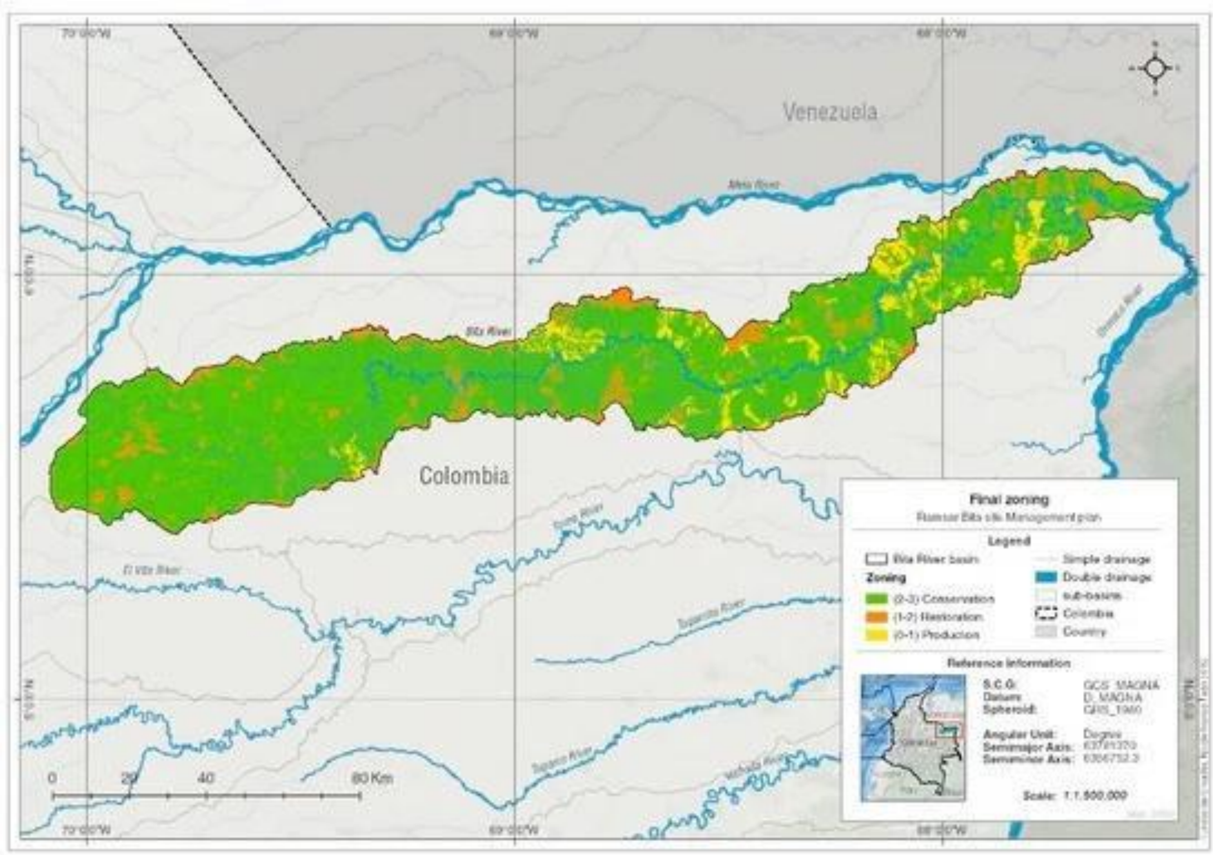
***Pressures and Threats:** Biodiversity in the Bita River basin is threatened by land use conversion, ranching, agricultural run-off, over-harvested fisheries/forests, infrastructure development, tourism and climate change.*

***Key Players:** In 2014, the Alliance for the Protection of the Bita River[231] was formed by government entities and civil society with a mission to develop a strategy to protect the Bita River. Success is attributed to the systems thinking and decision-making framework developed by communities, local entities, and government.*

***Successes:** The Alliance serves as a model in its engagement of fishers, farmers, companies, scientists and citizens to collaboratively identify priorities, understand relationships and implement conservation actions. After the designation, a 228,000-hectare ecological corridor was also created within the Ramsar site to connect stretches of the river supporting wildlife movement and migration. By expanding its national system of protected and conservation areas in recent years, including the Bita Ramsar site, Colombia announced it has already achieved its goal to protect and conserve 30% of its lands and waters to curb biodiversity loss.*

***Challenges:** understanding governance schemes, balancing conservation and development goals, conflicting land and water uses, clarifying land use implications, developing plans to promote economic alternatives, participatory wildlife monitoring, appropriate funding for implementation, capacity building.*

Financial information: *The Government of Colombia, WWF and other non-profit, public and private partners recently announced a US $245 million financing agreement to support the country's protected and conservation area system.[232] Tropical Forest Conservation Act funding was administered by Fondo Acción and supported by World Wildlife Fund, The Nature Conservancy and Conservation International.[233] The Bezos Earth Fund has supported Conservation International in identifying, designing, and registering OECMs in Colombia, including the Ramsar site Bita River Basin Wetlands Complex.*[234]



Pärnu River, Estonia

Name	*Pärnu River, Estonia*			
Designation type / protective mechanism	*Migratory Swimway, National Water Act*	*PA*	*OECM*	*30x30*
Status	*Dam removal between 2018-2019*			
Primary aim	*To restore the free-flowing condition and important habitat of a river and manage freshwater fishes over their entire migration route.*			
Governance type	*National agency (restoration work led by Estonia's Environment Agency)*			

The Pärnu River (144 km) is the second longest river in Estonia, with 270 tributaries covering 20% of Estonia.[235] The river was historically important for salmon, before dams and weirs impeded its flow. The most significant barrier was the privately-owned 150-meter wide, 4.5-metre-high Sindi Dam built in 1834, a mere 14 km from the estuary.[236] In an effort to restore salmon populations nationally, the Water Act requires effective fish passage at all barriers. After a multi-year consultation process dam removal was determined to be the most cost-effective option., Estonia's Environment Agency removed the Sindi Dam as well as other smaller dams upstream. This enabled over 3,300 km of waterway to flow freely again, with salmon and other fish able to resume their natural migratory routes within the "swimway." Migratory swimways are rarely considered the equivalent of protected areas. However, given their importance to biodiversity, swimways have the potential to be accepted as OECMs (if not now, possibly later) provided they are specifically defined and effectively contribute to biodiversity objectives by way of managing migratory freshwater fish over their entire migratory path. It is not clear that the Pärnu River is currently equivalent to an OECM.

Objectives: *Building on the idea of "flyways" for migratory birds, "migratory swimways" are defined as "rivers and associated ecosystems that support the entire migration routes of biologically and/or socioeconomically important freshwater fishes."[237] Swimways lead to improved river connectivity, ecosystem functioning and nutrient transport. A "Global Swimways" programme would provide metrics to assess development impacts and identify rivers in need of more restoration.[238] Restoration of the Pärnu River allowed migratory fish to swim 100 km upriver in addition to enhanced recreational opportunities including fishing, paddling and other nature-based tourism. Beyond biodiversity conservation and recreational values, there are considerable benefits from improved fisheries, flood protection, drinking water quality, and cultural aspects important to local communities. Restoration efforts also helped Estonia meet the EU Framework Directive goal to restore salmon habitat.*

Pressures and threats: *Migratory fish are disproportionately threatened compared to other fish groups.[239] The Pärnu has been threatened by flow alteration and fragmentation, as well as agricultural pollution.*

Key players: *Estonia's Environment Agency has led restoration efforts in consultation with non-profits, companies, academic institutes, and local communities. Dam Removal Europe is a pan-European network of organizations – including the World Fish Migration Foundation, Rewilding Europe, World Wildlife Fund, Rivers Trust, and European Rivers Network France – dedicated to scaling up Europe's dam removal efforts.*

Successes and challenges: *Restoration efforts have improved the biodiversity and ecological conditions for 3,300 km of river habitat, directly impacting 32 species of fish in the Pärnu River basin.[240] Success is attributed to involving communities and civil society early and throughout the planning and implementation phases of restoration. Establishing buy-in from stakeholders proved more challenging than anticipated. Improved monitoring of freshwater movements is required, with opportunities for new biomonitoring techniques.*

Financial information: *The majority (85%) of the €15 million Pärnu River restoration project (2015-2023) was funded by the European Union, with the rest covered by the Estonian Government.[241] The government had to purchase the Sindi Dam and surrounding land for €1.3 million. In terms of "savings" (averted costs), Estonia's Environment Agency estimated the dam's impact on nature was costing about €4 million annually.[242]*

San Pedro Mezquital River and Water Reserve, Mexico

Name	*San Pedro Mezquital River in Mexico*			
Designation type / protective mechanism	*Water reserve*	*PA*	*OECM*	*30x30*
Designation status	*Established (2014) – Mexico's first water reserve*			
Primary aim	*Providing water reserve, particularly in the face of changing climate, by maintaining natural flows.*			
Governance type	*Ministry of Culture (country-level)*			

Designation process and key players*: In 2008, the Government of Mexico inquired with the Federal Electricity Commission about the potential to construct the Las Cruces hydropower dam along the San Pedro Mezquital. In 2009, non-profit organizations presented a petition to the Secretariat of the Ramsar Convention detailing concerns about how the dam would affect the river and its resources. In September 2014, Mexico's Secretariat of Environment and Natural Resources authorized the Las Cruces dam project with a set of 18 conditions, including that it should not violate the Environmental Water Reserve. Experts, including scientists from local, regional and national universities, representatives from federal agencies, and NGOs, among others, indicated that the project design and proposed operation would not fulfill environmental flow requirements. As originally designed, the dam would modify the hydrology of the river and reduce the linkage between the river and the Marismas Nacionales.[243] Thus, the construction of the dam has been delayed unless it can meet the environmental flows requirements, in addition to the other 17 conditions set out in the decree.*

Values: *The San Pedro Mezquital is the last free-flowing river in the western Sierra Madre Mountains in Mexico. As the river flows 540 kilometers en route to the Pacific Ocean, the mainstem of the river ebbs and flows depending on the time of year.[244] During the rainy season, the San Pedro Mezquital swells with runoff, inundates the floodplain, and supplies the water and nutrients that support the highly productive Marismas Nacionales (National Wetlands, Biosphere Reserve and Ramsar site), home to a large (200,000 hectare) mangrove forest. During high flows, the river spreads across its floodplain, depositing nutrient-rich sediment. As such, agriculture and fisheries sustain the surrounding 432 local communities.*

The San Pedro Mezquital was the first Environmental Water Reserve designated by Mexico with around 80% of its mean annual runoff allocated to ensure water and nutrients are supplied to the Marismas Nacionales. In September 2014, the President of Mexico signed a decree for the 11 sub-basins that constitute the San Pedro Mezquital Basin.[245] This Reserve decree outlines three types of reserves: one for domestic use, another for hydropower generation, and the third for the environment. The ***Environmental Water Reserve*** *regulates any water-related infrastructure. Before construction can be authorized, projects must prove that they will not exceed the Environmental Water Reserve and negatively affect flow to the Marismas Nacionales. In addition to environmental flow requirements, other conditions placed on development within a Reserve include sediment parameters and protection of social resources related to Indigenous People's rights and land (cultural sites), among others. The San Pedro Mezquital Basin is one of six pilots designed to test the effectiveness of implementing water reserves and associated flow regime.[246] It is anticipated that this Reserve will protect and maintain connectivity for seven aquifers, three natural protected areas, two Ramsar sites, and 100 protected species in the region.*

Threats/ Challenges: *The main obstacle hindering the implementation of environmental flows and guaranteeing water security in Mexico is lack of water in the dry season. The reserves serve as a means of addressing water security issues as well as adapting to climate variability. The reserve represents a percentage of the mean annual runoff which can be used to buffer climate impacts and help to manage risks.*

Lessons from Case Studies – Observations, Gaps and Emerging Conservation Mechanisms

Summary, notable lessons, gaps, key outstanding questions from the case studies

Conventional protected areas are useful for protecting some but not all inland waters. Linear habitats like rivers, streams and estuaries have seldom fit into a conventional protected area framework unless the site has been sited, sized, configured and managed to accommodate the inland water conservation objectives in the protected area (e.g., the emerging Vjosa River National Park) and threats from influences outside the area boundaries have been abated. The emergence of the OECM framework has come alongside development of new approaches to freshwater conservation, many of which can be OECMs or even full protected areas or may fall outside this framework. All offer new approaches to conservation. Some are relatively untested; others already have proven nature conservation benefits.

In our summary below we identify two main groupings of approaches that can enable 30 x 30: (i) new and emerging approaches and (ii) more established approaches that are being examined a new in light of their potential to contribute to the post-2020 GBF. The boundary between these two can be fluid.

Emerging mechanisms for protection and conservation of inland waters

Amongst the newer approaches, the following have been developed to adapt to some of the protection gaps for the unique needs of inland waters ecosystems including considerations for connectivity, hydrologic regimes and water quality. More information will need to be developed to systematically speak to their long-term effectiveness, although this is still the case in general for protected and conserved areas:

- **Fluvial reserves**: applied in Spain, Argentina and emerging in Ecuador, designations to date have served as a specific protected area designation for rivers that include the mainstem, bed and a riparian buffer for a designated length. In Argentina, the application has been linked explicitly under national protected area legislation as an application specific to lotic systems (flowing water).
- **Water reserves**: volume of water allocated to specific uses within a basin context to enhance long-term resiliency and sustainability. An environmental water reserve is the volume allocated from a river for environmental use,[247] involving specific protections applied to protect environmental flow.
- **Community-fisheries reserves for lakes and rivers**: increasingly recognised and drawing on concepts such as Locally Managed Marine Areas (LMMAs), aiming to ensure sustainable fish stocks for local communities, with additional benefits for other species.
- **Free-flowing rivers**: legislation to ensure that rivers are not dammed or impounded throughout their length or an ecologically relevant management unit, to maintain ecosystem integrity. This can include **migratory swimways,** conserving the connectivity of rivers and their associated ecosystems that support corridors and core habitats along migration routes of biologically and/or socio-economically important freshwater fishes.[248]
- **Climate corridors**: connectivity corridors designed to allow dispersal of species as environmental conditions alter as a result of climate change, established through legal or voluntary means.

- **Carbon capture areas**: particularly peatlands, where high carbon stores (and in many areas low value for other uses) is encouraging management principally for carbon sequestration and storage, including restoration (rewetting) with clear biodiversity benefits as a side effect.
- **Pollution control zones**: such as nitrate exclusion zones, which take the pressure off aquatic systems and help to maintain a balanced ecology.
- **Rights of nature**: recognition of the legal rights of nature across whole ecosystems or habitats, such as rivers and lakes, opening up the possibility of controls over actions that have or may damage these rights.

Established mechanisms with potential to provide expanded contribution to protection and conservation of inland waters

- **Source water protection areas including aquifer recharge**: which can include forests and wetlands protected to regulate local and downstream water quality and quantity, with associated conservation values.
- **Sacred sites**: which can include highly protected sites (like sacred springs, lakes and river reaches) but can also include sacred systems that in practice receive little practical protection (like the Ganges).
- **Coastal marshland as flood prevention and storm protection**: increasingly recognised as important in the wake of several major disasters associated with its removal (e.g., New Orleans floods, Caribbean islands coastal storms)
- **Flyway stop-over wetlands**: places that migrating water birds can rest and feed; these are often but not always protected areas and their value depends on the chain of sites remaining unbroken. The protection status and management may also be limited to the migration season.
- **Floodplain protection zones**: serious flooding (e.g., of the Rhine) has highlighted the need for spillover sites rather than channelling water downstream, which is increasing the opportunities for restoring the connection and function of rivers and floodplain wetlands to absorb floodwaters.

Gaps

Three major gaps become clear from our analysis. Opportunities to address these gaps are discussed in Section 3:

1. **Designation type and boundary configuration:** Many designation types and designs lack consideration of the unique needs of inland water ecosystems which result in inappropriate scale, mechanisms and management for durable conservation of inland water ecosystems.
2. **Conservation planning**: There is still very limited experience in integrating some of the new or re-emerging approaches to conserving freshwater ecosystems into broadscale conservation plans, which often still rely primarily on protected areas and often only strictly protected areas (IUCN categories I-IV)
3. **Monitoring**: Given that many of these approaches are relatively experimental, data on their success, failure, strengths and limitations are urgently needed. Innovative mechanisms are needed for monitoring outcomes, and for compiling and analysing this information on a watershed or ecosystem-wide scale.

Section 3: A Path to 30 x 30: Improving effective conservation of inland waters

Key messages

- Implementation of 30x30 will be founded in existing and future protected areas and OECMs – and aims to address quality in addition to coverage
- While the attention to protected and conserved areas has most often focused on designation and management to secure either terrestrial or marine species, there are a multitude of cases – and resources – that provide guidance for effective management and future conservation of inland water ecosystems and dependent biodiversity.
- With an estimated 15% (or more) of inland waters currently included in protected areas and OECMs, one of the quickest ways to boost effective conservation of inland waters is to increase the attention paid to aquatic systems within existing designated areas.
- To address the pace and scale of biodiversity loss and climate change impacts, there is a need to design for resilience in the next decade's conservation investments. This will require building from existing, often isolated and biome-specific area designations, to **develop integrated regional protected and conserved area networks. Network design and designations should preserve critical physical and process-based connections among terrestrial, inland water, coastal and marine environments – now and into a future with a changing climate.**

Improving management effectiveness of existing protected and conserved areas

With an estimated 15 per cent (or more) of inland waters currently included in protected areas and OECMs,[249] *one of the quickest ways to boost effective conservation of inland waters is to increase the attention paid to aquatic systems within existing protected areas and OECMs*. While a proportion of such areas are set up explicitly or mainly to conserve lakes, pools, marshes and other wetland areas, many terrestrial and marine protected and conserved areas contain aquatic features that receive little attention in management plans.[250] Acreman at al. (2019) conducted the first systematic global review of protected and conserved area effectiveness for inland water biodiversity. They found that less than 1 per cent of published and reviewed studies included the information needed to assess effectiveness for freshwater biodiversity conservation. Of the 75 available cases, 38 reported positive, 25 neutral and 12 negative outcomes for freshwater biodiversity as a result of the protected or conserved area establishment and management.[251]

The introduction has already recounted research suggesting that in many cases large increases in freshwater conservation gains can be achieved by a slight adjustment in management effort, and with very little costs to ongoing management of terrestrial values.[252] This section of the report provides early guidance on how these gains might be achieved. To recap, this applies to those places where inland waters are present in protected areas but are largely ignored in planning and management (Figure 2 above). This could include entire ecosystems, such as lakes, marshes, streams running from their source into a mainstem river, or sections of habitats, such as a river running through a protected area. All of these offer different opportunities and challenges for managers.

The range of options will depend to a large extent on whether the designated area has effective jurisdiction over the entire habitat. In many cases the fact that a headwater stream, lake, pond or area of marshland is entirely within a protected area may be enough to provide effective conservation, even if subject to benign neglect, but this will not always be the case. At the other extreme, rivers or lakes only partially within the site, or serving as a border for the site, will clearly be influenced by many factors over which managers have little control, such as pollution or interruption of flow, but even in these cases careful conservation interventions can help. For example:

- The protected area in Lake Malawi only protects a relatively small proportion of the whole lake, but provides breeding and spawning grounds for fish, which conserve populations of endemic species (and incidentally also help maintain sustainable fisheries for local people).
- Management of breeding and feeding grounds for river dolphins, and controls on harmful fishing equipment within protected areas, helps to maintain populations even if they are impacted by human activities along other stretches of the river.
- Canalisation of rivers and building levees has channelled flood waters so downstream communities are more severely impacted, even across national borders. A protected area or series of protected areas that restores connection to and the function of natural floodplain can reduce peak flows, even if management in the rest of the stretch remains unchanged.

Box 5: **Guiding Resources**

Over the last several years, dozens of resources have been published that can serve as guideposts for improving protected and conserved area establishment and management in delivering protection of inland water ecosystems, supporting their recovery and conserving dependent biodiversity. Those resources are briefly summarized throughout this section. A few guiding resources include:

- Dudley and Abell 2008. **Section 6. Specialized Applications, Inland Water Protected Areas** in *Guidelines for Applying Protected Area Management Categories*.
- Pittock 2015. Chapter 19. **Managing Freshwater, River, Wetland and Estuarine Protected Areas** (40 pp)
- Abell et al. 2016. **Looking Beyond the Fenceline: Addressing Protection Gaps for the World's Rivers** (11 pp)
- Finlayson et al. 2019. **Freshwater Ecosystems in Protected Areas: Conservation and Management** (279 pp)
- Acreman et al. 2019. **Protected areas and freshwater biodiversity: a novel systematic review distils eight lessons for effective conservation** (14 pp)
- Tickner et al. 2020. **Bending the Curve of Global Freshwater Biodiversity Loss: An Emergency Recovery Plan**. (12 pp)
- Higgins et al. 2021.**Durable Freshwater Protection: A Framework for Establishing and Maintaining Long-term Protection for Freshwater Ecosystems and the Values They Sustain** (16 pp)

While a range of opportunities and mechanisms are likely to be available when evaluating how best to incorporate inland waters in existing protected areas, these need to be prioritised with respect to urgency, cost, feasibility, time needed for completion and access to requisite skills and people. Given the assumption that inland water management is being brought into places where the experience is predominantly terrestrial, it is important that there are some early "wins" to raise enthusiasm and reassure managers that they are not wasting their time, so small actions to make an immediate difference are probably better to start with than large and expensive operations; these can come later if necessary.

Retrofitting inland water conservation into existing terrestrial and marine management plans will likely benefit from customized guidance and capacity building resources. In the following section, foundational resources are synthesized to provide a general framework for improving the management of protected and conserved areas to incorporate the unique needs of inland water ecosystems. These unique needs include attention to landscape/watershed context, connectivity (lateral, longitudinal and vertical), flow regimes, and complex management authorities.[253]

Assessing management effectiveness of inland waters

The draft Target 3 stresses the need for protected and conserved areas not only to be in place but to be effective; in theory eliminating not only paper parks but also sites that are not being managed effectively. Measuring and applying these principles will not be easy, but they do tend towards a greater emphasis on assessing, managing for and reporting on management effectiveness. Target 3 implies that assessment should also cover trends in conservation outcomes and social issues, including the quality of governance. For protected areas and OECMs, this means finding ways to report on the status of biodiversity and ecosystem services and also, to an increasing extent, on social, economic and cultural factors. A more detailed description of options for assessing management effectiveness is given in **Appendix 1**.

Design, designation, and management of protected and conserved areas – moving forward

In addition to managing existing designated areas, on the path towards 2030, countries, agencies and IP & LCs will be simultaneously exploring opportunities to expand protected and conserved areas across realms to achieve the 30 per cent global target. As discussed previously, the target is more than area-based coverage and includes improving effectiveness and equity in existing areas in addition to new areas.[254]

Prioritization and systematic conservation planning

Research shows that a focus on large-connected areas and careful prioritization and planning will be required to meet the global 30 per cent target. To address the pace and scale of biodiversity loss and climate change impacts, there is a need to design resilience into the next decade of conservation investments. This will require building from existing, often isolated and biome-specific area designations, to **develop integrated regional protected and conserved area networks that preserve critical physical and process-based connections between terrestrial, inland water, coastal and marine environments – now and in a changing climate.[255]**

Systematic conservation planning is a tool that can support prioritization at regional, national and transnational scales with applications across marine, terrestrial and inland water environments.[256] It is a data-driven participatory process with the goal of identifying a portfolio of priority places that represent the complement of habitats, ecological systems and native species in a given area in the most efficient and effective way.[257] In addition, the participatory approach includes rights holders and stakeholders, holding a range of values, and includes a suite of conservation tools including OECMs. Key elements include stakeholder engagement, representation, condition, connectivity, threats, additionality, effectiveness and feasibility. A range of approaches can be used from a basic workshop-driven process, to more analytically involved approaches and decision-support tools (e.g., Marxan).

These approaches are particularly important for inland water systems that have landscape-scale dependencies on their upstream catchments and connectivity with groundwater, floodplain and downstream habitats (discussed in more detail below). Resulting priority conservation areas should be of sufficient size and configuration to connect key elements of the waterscape and maintain biodiversity. These approaches can also be used to prioritize which existing terrestrial or marine focused management plans could be adapted to include freshwater/inland water conservation objectives.

As a final note, planning should take full advantage of and integrate existing and planned investments across global treaties and commitments (Ramsar, Sustainable Development Goals (SDGs), UN Framework Convention on Climate Change (UNFCC), Convention on Migratory Species (CNS), UN Convention to Combat Desertification (UNCCD) Land Degradation Neutrality target, among others).

Indigenous Peoples and Local Communities

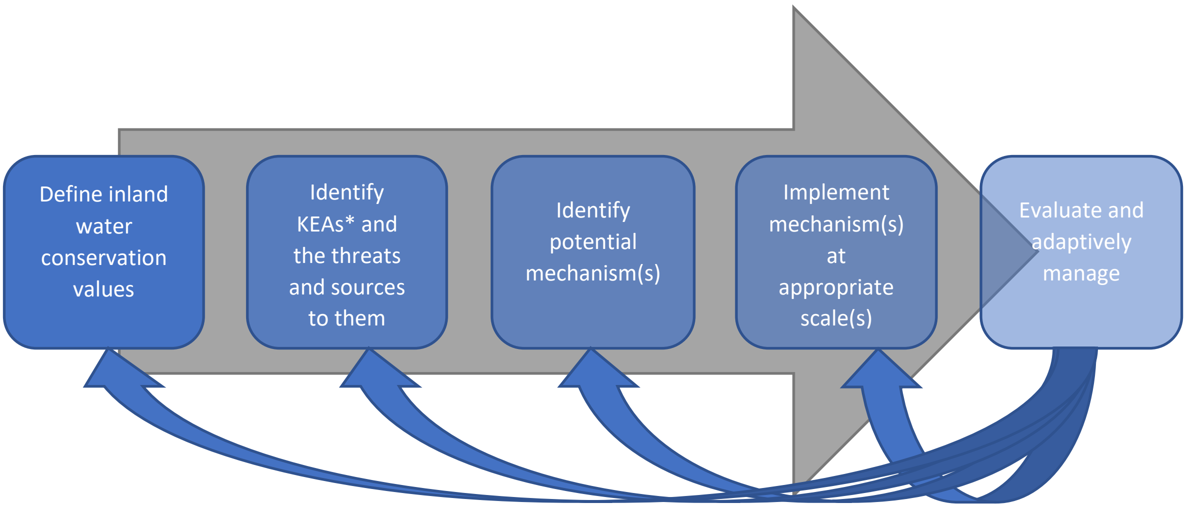
As long-term biodiversity stewards, recognising the rights, knowledge and contributions of Indigenous peoples and local communities is key to the design and implementation of effective inland water conservation. Their lands and territories overlap many important biodiversity sites. From a conservation perspective, prioritising sustainable funding for IP & LCs appears to be more affordable, financially viable and essential to achieving effective long-term conservation at the scale needed. The application of Free, Prior and Informed Consent (FPIC) is essential (and an obligation for Indigenous peoples under international agreement) and should ensure that IP & LCs support approaches taken in their territories. Careful scrutiny is needed from governments, donors and NGOs to ensure the FPIC process is followed correctly.[258] The voluntary *Akwé Kon Guidelines*[259] are principles for carrying out assessments on IP & LC territories and sacred sites. Any implementation of 30x30 should follow the UN's 16 principles on human rights and the environment.[260]

It is important to note that, for the IP & LCs involved, conservation may be one of a number of objectives, which will likely include tenure security, cultural recognition, capacity building and respect for self-determination. **Freshwater-specific guides for IP & LC engagement, including the Practitioners' Guide to Applying the Voice, Choice and Action Framework, provide customized and useful frameworks.**[261]

Site specific design, designation, management and monitoring

Relative to terrestrial ecosystems, inland waters have unique needs to consider including the importance of attention to landscape/watershed context, maintaining connectivity (lateral, longitudinal and vertical), water quality, flow regimes, and complex management authorities.[262]

In regard of these unique needs, the approach outlined below draws on the **durable freshwater protection framework**. Within the framework, "*durable*" is defined as having a high probability of providing dedicated, secure and enforceable protection into the future with a suggested timeline of at least 25 years. Embedded in this is the alignment of protection mechanism(s) and scale of the area with conservation objectives, considering any reasonably foreseeable threats. The framework can be applied to both new and existing (protected and conserved areas, in the latter case by amending the management plan.[263]



* KEA = Key ecological attributes: for inland waters, KEAs include hydrologic regime, connectivity, water quality, habitat and biotic composition.

Figure 5: **Steps towards durable freshwater conservation. Stakeholder engagement is critical for all steps. (Adapted from Higgins et al. 2021)**

STEP 1: Define values: a broad step involving identification of the values or management objectives of conservation. In the case of protected and conserved areas these will always include some aspects of biodiversity but may also include a range of ecosystem services, potentially including both for local communities and people living further away, so long as these do not undermine biodiversity conservation objectives. As mentioned previously, for many existing areas, inland water objectives have not yet been defined for management plans. This is an important first step. For the consideration of new areas, this step is critical in selecting a site design and designation mechanism appropriate to support the identified objectives.

The Ramsar Convention, United Nations Development Programme, International Union for Conservation of Nature, Convention on Migratory Species, UN Sustainable Development Goals, and U.S. Wild and Scenic Rivers Act all provide adaptable frameworks for evaluating values linked to the natural, social, economic, historical and cultural values of inland waters.

Box 6: **Inland water values**

Any list of potential values could be long, but will likely include a combination of:

- Freshwater ecosystems or habitats of particular importance – including remaining free flowing rivers.
- Flora and fauna of particular importance – e.g., rare, threatened or endemic species.
- Ecosystem services e.g., downstream water supply, disaster risk reduction from flooding or drought, carbon sequestration and storage.
- Compatible utilitarian human uses – sustainable fishing (inside site or within spillover area), recreational uses, gathering plant material etc.
- Compatible cultural/spiritual/aesthetic human uses – visitation to sacred sites, artistic inspiration.

Depending on the area, the result could be simple or it could result in a broad list of values or objectives to consider when developing management plans. A variety of tools are available for identifying the range of values at a site,[264] from complex, software driven mapping exercises to simple workshop approaches; more than one approach may be needed. Wherever there are people living near the area of focus or using the site regularly (for example transhumant communities), values should be identified as much as possible in cooperation with all relevant stakeholders. The Protected Area Benefits Assessment Tool[265] is one of several methodologies for collecting this type of information. These kinds of approaches are invaluable for finding out local perceptions, which are critical in planning management interventions, but may also need to be augmented by other approaches such as rapid biodiversity assessments or analysis of satellite imagery.

Assessing ecosystem services with local stakeholders in Lake Skadar, Montenegro

STEP 2: Identify Key Ecological Attributes and Potential Threats: Inland water systems have five key ecological attributes that sustain ecosystem functions – hydrologic regime, connectivity, water quality, habitat and biotic composition. These KEAs are identified, along with examples of potential threats and sources (Table 3.1). Note that climate change is a global threat that should be considered in the management for all existing and future protected and conserved areas.

All Key Ecological Attributes – **hydrological regime, connectivity, water quality, habitat and biotic composition** - are important for the long-term health of the ecosystem. But the ones to focus on when reviewing the design and/or management interventions within a protected or conserved area are those that are critical to the conservation values identified in step 1 and may remain under pressure given the watershed context and despite the existing or potential conservation status of the sites.

Table 3.1. **Threats to Key Ecological Attributes**

Adapted from Higgins et al. 2021 and including key elements of Pittock et al. 2015, Tickner et al 2020,

Key ecological attribute	Threats	Some sources of threat
Hydrological regime: Timing Magnitude Duration Frequency and Rate of change	• Changes in water flow and level • Siltation • Glacier melt • Changes in rainfall frequency, intensity and seasonality	Dams Irrigation Industrial water use or transfer Land use change – particularly deforestation Climate change
Connectivity: Lateral (floodplain connection), Longitudinal (up and downstream), Vertical (between surface and groundwater) Landscape (loss of other waterbodies on bird migration routes)	• Dams • Levees • Road and stream crossing • Land use change • Drainage	Dams and water resource development Flood control Road development Drainage of marshes and peatlands
Water quality: Nutrients Dissolved oxygen Sediments Temperature	• Point source nutrients • Bacteria • Toxic chemicals • Reduction in sediment transport	Agriculture Livestock management Urban/peri-urban areas Land-use change including deforestation Sewage Industry Mining
Habitat Structure Distribution Abundance Condition	• Wetland conversion • Riparian degradation • Changes in freshwater microhabitats • Climate change	Channelisation Mining Sewage treatment Land use change including floodplain development Dam and other infrastructure
Biotic composition Species composition Species abundance Species distribution Species health Ecological composition	• Over-harvesting • Invasive species • Environmental change	Unmanaged fisheries Agriculture, poaching, pet and landscaping trades Transportation Pollution and toxic chemicals Climate change

Box 7**: Explanation of Key Ecological Attributes**
Key Ecological Attributes (KEAs) are **aspects of a target's biology or ecology that, if missing or altered, would lead to the loss of that target over time**. So, for a coral reef ecosystem, KEAs might be size of the reef and species composition, while for a penguin species they could be reproductive success, population size and population structure. **For inland waters, these aspects include hydrological regime, connectivity, water quality, habitat and biotic composition**

Five questions are important:

1. What KEAs are critical to your freshwater management objectives?
2. Of those, which remain under pressure or threat?
3. Can the pressure be addressed within the protected area/OECM design or management?
4. If not, can steps be taken within the protected area/OECM to reduce the impacts to a functional degree?
5. Are there opportunities to work with stakeholders outside the protected area/OECM to reduce the wider impact?

So, for example applying the questions:

- <u>Example 1. Peatlands and drainage</u>: If we are interested in restoring the ecosystem integrity of a peatland within an existing OECM (question 1) and have identified hydrology and connectivity as critical attributes that remain threatened by drainage or erosion (question 2), the stressor can potentially be addressed within the protected area by working with local communities to determine whether a reasonable alternative is blocking drainage channels and rewetting peat to rebuild vegetation and secure remaining carbon (question 3).

- <u>Example 2. Freshwater mussels and river scour</u>: If we are focused on conserving threatened freshwater mussel biodiversity and their benthic- habitat within a specific reach of river (question 1), and if upstream channelisation has increased the risks of sudden flood events, threatening riparian vegetation and scouring out benthic-habitat and species (question 2), there may be little the managers can do to address decisions further upstream (question 3), but they could investigate opening up additional areas of the reserve to periodic flooding, thus creating a additional floodplain storage (question 3), reducing both the scour damage from flood events and further impacts downstream.

- <u>Example 3. Native lake fish and pollution</u>. If we have the objective of supporting populations of native fish and community fisheries in a lake and nutrient enrichment from surrounding agriculture is causing algal blooms and loss of oxygen (questions 1 and 2), this is outside the immediate control of managers (question 3) and it may be worth trying to restore additional reedbeds in the riparian areas around the lake to slow dispersal and provide some natural cleaning (question 4) but ultimately the issue will need to be addressed by working with other land owners and with the authorities to reduce the level of pollution (question 5).

- <u>Example 4. Aquatic megafauna and future water withdrawals</u>. If we are scoping the establishment of a new area of protection to support a hippopotamus population and we know they require a river depth of about 1.5-2 meters, especially during the dry months (question 1) and there are potential future upstream water withdrawals that could lower the river depth during the dry season (question 2), we would recommend designing the protected area designation with an environmental flow standard that clarifies the river conditions needed to maintain the objectives of the area (question 3) while at the same time, working pro-actively with upstream water users to assess alternative water sources to reduce future demands (questions 4 and 5). Alternatively, if these threats cannot be abated, the ability of the area to support the objectives over the long-term should be re-evaluated and alternative areas of conservation investment should be considered.

STEP 3: Identify potential mechanisms: building on discussions under part 2, once objectives and "at threat" KEAs have been identified, the protected or conserved area design, designation and management plan can be customized to address these needs and pressures at the right scale, and over the long-term. The key here is to identify protection and conservation mechanisms that, when combined, are most likely to abate or mitigate threats over the long-term

For **existing** protected and conserved areas, these may fall into three categories:[266]

1. **On-site management**: physical management actions to address threats to KEAs, e.g.,

- Manage ground and surface water withdrawals
- Introduce coarse woody debris into streams to create cover, plunge pools and aid fish breeding
- Establish riparian buffers around waterways and avoid permitting incompatible use within those areas like herbicide treatments, roadways and park facilities
- Rewet previously drained peat or marshland
- Restore riparian and lakeshore vegetation to provide cover for breeding water birds
- Restore natural water flow, connectivity and floodplains
- Remove culverts, levees, dams or other barriers within the area

2. **On site or nearby governance:** negotiations with rightsholders and stakeholders, e.g.,

- Distribution of dolphin pingers (acoustic devices to scare off river dolphins) to local fishing communities to avoid accidental bycatch
- Agreement on maximum catch levels, closed seasons and other aspects of sustainable fishing
- Codes of practice for tourists, including use of river craft and disturbance of breeding birds and spawning grounds
- Agreement to environmental flow and water quality standards
- Slightly shifting boundaries for areas that are bordered by rivers to include the stream, its bed and riparian areas on both sides (**Box 2**).
- Liaison regarding care and visitation of sacred lakes or springs
- Installation of waste treatment plants/reed beds for communities living upstream

3. **Off-site negotiation of management changes**, e.g.,

- Lobbying government for control on the number of intensive livestock units in the catchment
- Liaison with flood defence agencies on nature-based solutions to flooding
- Negotiation with forestry companies upstream to maintain natural vegetation strips along rivers
- Collaboration with water companies to encourage upstream PES schemes
- Promotion of sustainable fishing practices along the length of a river beyond the PA

For **designing and scoping new protected and conserved areas**
Questions of priority locations and configurations are best answered through participatory systematic conservation planning.[267,268] Dozens of case studies presented the array of designation mechanisms that can be used for protected and conserved areas. Often a complement of mechanisms are needed, at different scales, to meet objectives while addressing threats. To illustrate this point, a categorization of common mechanisms, their applications and an example case study for each are provided in Table 3.2.

As minimum best practice, area-based designations should meet the unique needs of the inland water habitats they aim to conserve by considering:

- *<u>Landscape/watershed context and incorporating as much of the inland water focal area habitat (Figure 6a) as feasible within the legal description of designated area boundaries</u>* including rivers, their bottoms and riparian areas (both sides of the river where administratively possible), wetlands, lake bottoms, shorelines, etc. Area buffers, ecological corridors and OECMs *may* be appropriate mechanisms for critical management zones (Figure 6b).
- *<u>Coupling the area-based legal designation with basic environmental standards</u>* for inland waters that incorporate the unique needs of these areas and habitats. These may already be embedded in the mechanism under consideration (e.g. fluvial reserve). If not, they can be described for the range of KEAs including environmental flows, connectivity, water quality, habitat and biotic composition.
    - In simplest form, environmental standards can be narrative in form, generally describing the characteristics or values of the water body to be sustained (e.g., conditions necessary to protect aquatic life shall be maintained; free-flowing river shall be maintained).
    - If the situation requires more clarity, quantitative standards may be required – in particular, for environmental flows and water quality. Several methodologies that range in investment from desktop to modelling and participatory processes are available to develop standards.

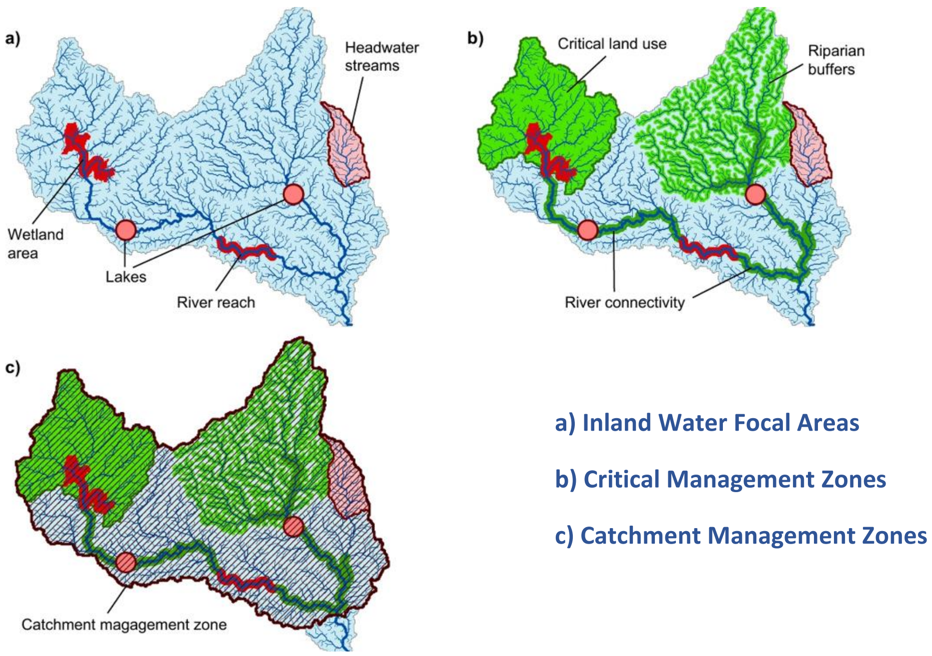


Figure 6. **A protection approach tailored to inland water ecosystems including focal areas, critical management zones and catchment management zones (Abell et al. 2007)**

Table 3.2: **Mechanisms, applications and examples** (Adapted from Higgins et al. 2021)

Type	Applications	Case study example
	Legal Mechanisms	
Legislation focusing on freshwater ecosystem protection	Protection legislation and acts Fishing/fisheries policies Interjurisdictional freshwater Ecosystem basin compacts Public policies creating financial incentives for resource protection	Upper Delaware Wild & Scenic River and complementary Delaware River Basin Compact (U.S.)
Administrative Designations giving special protection to a whole or portion of a freshwater ecosystem	Executive orders requiring the use of best management practices protected areas designations OECMs	Ivindo River National Park and World Heritage Site (Gabon) – designated to protect the Ivindo River, cascades and important riparian/migration corridor.
Regulation focusing on freshwater ecosystem protection	Environmental flows Licensing of dams Water rights allocations Riparian zoning regulations Fishing regulations Water quality regulations	Fluvial Reserves (Spain) – integrate designation with regulatory jurisdiction to review, deny, permit and/or condition infrastructure projects that may affect a reserve. Projects prohibited within reserves.
Acquisition of enforceable rights in land or water by a holder of those rights for the purpose of river protection	Transfer of development rights programs Conservation easements Flood easements Riparian land acquisition Water rights	Gayini Nimmie-Caira (Australia) – purchase 80,000 hectares of land and water rights and transferred rights to First Nations who manage it as a recognized protected area.
Judicial action where courts with jurisdiction order some form of protection, pursuant to actions brought by parties with standing to defend the integrity of a natural resource or feature (e.g., a river, lake, wetland, aquifer, biota, ecosystem service)	The "Public Trust" legal doctrine "Rights of Nature" initiatives	Rights of Rivers, Rio Atrato (Colombia) (Ref Global Map from IR)
	Non-Legal Mechanisms	
Indigenous peoples and local communities **Collective Management** of Common Pool Resources	Community-based fisheries management Community Irrigation systems Communal Forest management	Mae Ngao Community Fish Reserve (Thailand)

Note: **Legislation** is defined as a law, directive, policy, or enabling framework enacted through an approval process by a legislative or representative governing body having widespread applicability; **Regulation** is defined as a specific rule, guideline, procedure, or order that is often designed to implement a legislative policy or law and is adopted by administrative or executive agency action with a more limited scope or application.

STEP 4: Implement mechanisms: A range of mechanisms are likely to be available; these then need to be prioritised with respect to urgency, cost, feasibility, time needed for completion and access to requisite skills and people.

For existing protected and conserved areas, as described above, the given assumption here is that freshwater management is being brought into places where the experience is predominantly terrestrial. Again, small actions to make an immediate difference are probably better to start with than large and expensive operations; these can come later if necessary. It is important to build momentum and reassure managers that they are not wasting their time.

STEP 5: Monitor, evaluate and adapt: Whether in an existing or newly conserved area, interventions will likely be new and therefore probably outside any current monitoring programmes.

Monitoring needs to be funded at an adequate level from the outset and to address both whether the identified mechanisms have been followed through (implementation monitoring) and whether these have had the desired effect (effectiveness monitoring). In order to do this effectively, baseline information should be collected.

- So, for instance, if an increase in coarse wood has been identified as a management aim (perhaps in a forested area that has previously been managed) monitoring would need to look at the physical result of CW addition (through inventories of material added) and whether there are measurable differences in geomorphology (pool created, or sediment accumulated), and the effect on fish populations or flood abatement.

- If dolphin pingers were distributed to fisherfolk in and around a protected area to use near their nets, monitoring must document if they are being used and whether this reduced bycatch deaths of river dolphins.

- If forestry companies agreed to leave wider riparian strips further upstream (perhaps as a result of forest certification requirements) monitoring would document whether this has been carried out in practice and if discernible differences can be seen in movement of riverside fauna, summer water temperature and flooding.

Monitoring is only worth doing if the results are used, so regular assessments are needed amongst staff responsible for the freshwater component of management and changes made if either outputs or outcomes are not trending in the direction hoped.

Many different inland water management approaches can fit both inside or outside protected areas and OECMs, depending on individual conditions and management choices. Few if any such management interventions are confined entirely to a protected area or an OECM.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Section 4: Developing a global baseline and indicator to track progress

Key messages

Aichi Targe 11 set a 17% protection target for inland waters but lacked a standard measuring mechanism. With the proposed 30 x 30 target, there is an urgent need to establish a baseline for inland waters protection and measure progress against it.

Sufficient data exists to develop and apply a method to estimate coverage that is simple, has clear caveats, and can serve as a foundation that accommodates growth and complexity over time, including the ability to measure and track representation, effectiveness, connectivity and important biodiversity areas. Like marine and terrestrial ecosystems, coverage could be reported globally as a percentage.

While coverage will be one important indicator of inland waters under 30x30, the broad nature of the target means that several other issues must be addressed, including management, connectivity and effectiveness.

This section provides a brief overview of the context, an estimated baseline global extent of conservation through Protected Areas and OECMs, followed by recommendations and key considerations in finalizing datasets in 2023 to begin measuring global progress toward 30 x 30 and initial recommendations on a set of indicators for inland waters.

Learning from Aichi Target 11

Inclusion of inland waters in the Post-2020 GBF area-based targets, including the proposed 30x30, requires the ability to establish a baseline and measure progress against it. Protected Planet, including the World Database on Protected Areas (WDPA) and World Database on OECMs (WD-OECM), has provided the mechanism for tracking this baseline and progress for Aichi Target 11, and is expected to do so for draft Target 3 (30 x 30) based on the draft monitoring framework, headline indicators and component indicators. Aichi Target 11 lacked a standard mechanism for estimating a global baseline and measuring progress toward the target of 17 per cent inland water coverage and management effectiveness. Protected Planet statistics do not currently differentiate inland waters from terrestrial and marine coverage or management effectiveness. Terrestrial metrics alone are inadequate, because protected lands do not necessarily confer protection to the inland waters to which they drain. Moreover, land-based metrics provide no window into the representation of inland waters in protected area systems.

Estimated baseline for global coverage

In recent years, several methods and datasets have been proposed for measuring global coverage of inland waters protection. Interpreted collectively, they provide valuable indicative estimates. We can estimate that globally, at least 15 per cent of the total extent of inland water areas are covered by protected and conserved areas (Table 4.1). These baselines, which overall suggest spatial levels of coverage near or exceeding the 17 per cent Aichi 11 Target, are considered to be indicative for several reasons: 1) global inland waters datasets have been incomplete, especially for wetlands; 2) the calculations include all protected areas, although currently we cannot determine which protected areas in the World Database of Protected Areas include inland water ecosystem management objectives and therefore could be assumed to provide freshwater conservation; 3) protected and conserved areas often use rivers to delineate boundaries and it can be unclear in the WDPA whether the feature is included within or adjacent to the protected area (due to difficulties in producing data to that level of precision) and 4) OECMs have strong potential to confer protection to inland waters, depending on their design and management, and improved OECM datasets may lead to increased coverage calculations. Importantly, the scope of Aichi Target 11 and draft Target 3 go well beyond coverage to include important factors, including effectiveness, that are discussed below.

Table 4.1: **Estimates of global extent (coverage) of inland waters in protected areas and OECMs published in peer-reviewed literature**

Coverage estimate	Inland Water Focus	Reference and notes
11.3%	Seasonally flooded wetlands (i.e., excluding rivers, lakes and reservoirs larger than 300m in width) covered by Protected Areas with mapped boundaries	Reis et al. (2017) used downscaled version of the Global Inundation Extent from Multi-Satellites database (GIEMS) supplemented with historic wetland extents given in the Global Lakes and Wetlands Database (GLWD).
15%	Permanent and seasonal inland surface waters covered by Protected Areas with mapped boundaries	Bastin et al. 2019. First to use high resolution 30 m validated Landsat data to define the global extent of permanent and seasonal surface waters
15.4%	Permanent inland surface waters covered by Protected Areas with mapped boundaries and adding areas delineated as points with estimated circular buffers	
16.4 %	Permanent and seasonal inland surface waters covered by Protected Areas with mapped boundaries and adding points as described above	
13.5-16%	Global proportion of river reaches by length within Protected Areas or forming their borders	Abell et al. 2017. Uses high-resolution hydrographic dataset, and proposes additional measure of upstream catchment protection
16%	Global proportion of river length within Protected Areas or forming their borders	Opperman et al. 2021. Uses recent global assessment of free-flowing rivers and highlights gaps in ecological representation
17%	Global proportion of total global free-flowing river length within Protected Areas	
20.7%	Waterbodies included in the Global Lakes and Wetlands Database (GLWD) within Protected Areas	Juffe-Bignoli et al. 2014. Provided one of the first global estimates using best available data at the time including the 2004 GLWD

Components of draft Target 3

Draft Target 3 outlines the commitment to conserve 30 per cent of terrestrial, inland water, coastal and marine ecosystems through protected areas and OECMs, at a global scale. As outlined in Section 1, Box 4, just as important as the scale of ambition of 30 per cent coverage, are the considerations that the resulting areas must be **ecologically representative, well-connected, effectively managed, equitably established and managed and integrated into wider landscapes and seascapes**. As drafted, the target must also address **importance for biodiversity** and **contributions to people**.

Over the last year, a global expert consortium has been working together to develop a readily implementable methodology that uses best available data to define the global extent of inland waters and to track coverage in protected areas and OECMs. A series of two expert workshops in 2022 highlighted agreement that **sufficient data are available to develop and apply a method to estimate coverage** that is simple, has clear caveats, and can serve as a foundation that can accommodate growth and complexity over time including methods to assess:

- effectiveness - how effectively the agreed conservation actions are being applied to freshwater ecosystems within areas of protection
- areas important for biodiversity
- connectivity.

The latter components will be considered in more detailed, subsequent analyses, which will include discussion of metrics of ecological condition of the inland waters system using, for example, Red List species data and the Connectivity Status Index. However, the essential first step is to understand where, spatially, protection may be occurring.

Recommendations for estimating coverage.

As past studies have demonstrated, measuring coverage of inland water systems by protected and conserved areas is possible (Table 4.1). Aligned with the proposed indicator for draft Target 3,[1] we propose assessing the extent of inland water ecosystems within the boundaries of protected areas and OECMs, and reporting coverage globally and in a percentage form. However, river and stream coverage should be measured and reported separately from lakes and wetlands, as flowing water systems require using linear units (i.e., kilometres).

A quantitative assessment of the extent to which inland water ecosystems are covered by protected and conserved areas requires two main data types:

- Spatial data on the extent of area-based protections
- Spatial data on the extent of inland water ecosystems

Below we discuss each of these data types and summarize globally available data sources in Table 4.2.

Table 4.2: **Globally available datasets for representing area-based conservation and extent of inland water ecosystems.**

Type	Sub	Globally available dataset(s)	Rationale
Extent of area-based conservation	PAs submitted to Protected Planet (PP)	World Database on Protected Areas	• Global coverage • Updated every month • Official data source to calculate global CBD indicators for marine and terrestrial PA coverage
	OECMs submitted to PP	World Database on Other Effective Area-Based Conservation Measures	• Global coverage • Updated every month • Official data source to calculate global CBD indicators for marine and terrestrial OECMs coverage
	Ramsar sites in Ramsar Sites information Service (RSIS), WDPA)	RSIS/WDPA database	• Specific dataset on inland water sites and wetlands convention
Inland water ecosystems	Rivers and streams	HydroSHEDs family: GLoRiC (2019), Free-Flowing Rivers (2019), HydroATLAS (2019/2022); Intermittent rivers and streams (2021)	• consistent globally • includes modeled discharge (flow volume) and size classes. • large database of river attributes at reach- and watershed-level including area upstream covered by protected area (WDPA) • includes condition metrics: FFR CSI, several others in HydroATLAS
	Lakes	HydroLAKES (2016)	• consistent globally • includes and distinguishes large reservoirs
	Floodplains	GFPLAIN250m (2019) – global high-resolution dataset of Earth's floodplains	• consistent globally • Draws mainly on modelling with little ground-truthing
	Floodplains and wetlands	GIEMS-D15 (2014)– global inundation map	• consistent globally • note that a newer 90m version is pending
	Wetlands	GLWD – Global Lakes and Wetlands Database	• Rather out of date but GLWD version 2 is soon to be finalised
	Surface water dynamics	Global surface water (2016) Global inland water (2020) Global Land Analysis and Discovery (GLAD)	• consistent globally • temporal dataset (1984-2020 and 1999-2021, respectively) • captures coastal waters
	Representation (supplemental analysis)	Freshwater Ecoregions of the World	• consistent globally • The ecoregions provide biogeographic context and the MHTs represent important differences in climate, hydrology, and other biophysical factors.

Spatial data to represent extent of area-based protection

The full range of types of protected and conserved areas are discussed in Section 2 (Typology). The World Database on Protected Areas (WDPA) and World Database on OECMs (WD-OECM), accessible via the Protected Planet website, are the best available sources for globally comprehensive data (including spatial data) for Protected Areas and OECMs. Countries may also substitute or complement WDPA/WD-OECM data with their own more detailed, accurate, and up-to-date data, especially for OECMs and Indigenous Protected Areas, where they are available at regional, national, and subnational scales. When using the data from the WDPA for assessing coverage of inland waters by protected areas and OECMs, there are several recommendations to be followed.

1) Classification of protected and conservation areas as marine, terrestrial, or inland water

The fields of the WDPA currently do not differentiate whether a protected or conserved area includes inland waters. Currently the differentiation is limited to: (1) predominantly or entirely terrestrial, (2) coastal marine and terrestrial and (3) predominantly or entirely marine (see the 'MARINE' field of the database).[269] There is no value for Inland Water or Freshwater Protected areas and inland waters could occur in all three categories. For example, the spatial extent of some predominantly marine areas may include the lower courses of rivers and transitional marine-freshwater ecosystems. For this reason, analyses of inland water protected and conserved areas should include all PAs and OECMs, regardless of their classification.

2) Treatment of protected and conserved areas without geographically defined boundaries

Within the WDPA, some areas do not have geographically defined boundaries, and instead their location is represented simply with a point defined by latitude and longitude. Many of these 'point-only' areas are currently Ramsar sites. UNEP-WCMC applies a buffering method around the point, with the buffered area matching the total size reported for the protected area.[270] While this buffering approach will not accurately represent how a river, lake or wetland intersects with the protected area, it gives less of an underestimate of global or national coverage than if the point data were excluded. Coverages both including and excluding these point-only areas can be calculated, to highlight where the difference is substantial and the generation of protected areas maps should be prioritized. Working with the Ramsar Secretariat to increase area data for Ramsar sites is a priority in terms of building a global picture of protected and conserved areas.

3) Ramsar Sites

Some countries recognize Ramsar sites as protected or conserved areas, while others do not, and many Ramsar sites overlap with protected areas under other designations. For that reason, we recommend that a global calculation of inland waters coverage includes a separate value for those Ramsar sites or portions thereof that are not encompassed by other protected areas. Additionally, Ramsar sites that are designed to conserve man-made habitats (as coded in the Ramsar Sites Information Services) should be reported separately. This topic is described further below.

4) Exclusion/inclusion of human-made inland waters from protection sites

Protected areas of various types may include human-made systems such as reservoirs, ponds, and canals. Ramsar specifically includes these human-made systems in their classification of wetlands.

There have been recommendations, both for SDG 6 and for draft Target 3 (30x30), that these human-made systems should not be included in measurements of inland water extent, or protection coverage of inland waters. However, Ramsar sites are defined based on characteristics of the biodiversity and ecology of the site that require protection; some World Heritage sites include human-made systems because of their biodiversity values within long-established cultural landscapes (IUCN Category V); and some human-made systems could be encompassed by OECMs. Until a more nuanced approach for assessing the biodiversity conservation value of protected human-made systems can be developed (see also section 2; discussion of OECMs), these protections should be included in calculations of coverage. A complementary calculation that removes human-made systems from inland waters datasets can illuminate areas for deeper analysis. (See 'Future Work and Considerations' for suggestions on how this process may be refined.)

Spatial data to represent extent of inland water ecosystems

Inland waters encompass a diversity of ecosystem types and sizes. Rivers and streams (flowing water or 'lotic' systems) and lakes and wetlands (standing water or 'lentic' systems) are often captured in separate datasets, because the geospatial data are generated using different methods and sources. Table 4.2 shows the most important of these datasets, many of which have been employed in previous studies of protection coverage (Table 4.1).

All of the data resources listed in Table 4.2, and used in previous studies, have both strengths and weaknesses for assessing inland water extent. One option is to create new datasets that are purpose-built for measuring the full range inland water ecosystems at a global scale, and there are already some potentially useful datasets under development (see 'Future Work and Considerations').

However, to allow stakeholders to properly include inland water systems in their area-based assessments of protection in the near term, it is necessary to have datasets and indicators that are (a) immediately available, relatively easy to use and aligned with other datasets and indicators being recommended for the Post 2020 GBF and SDGs (to ensure that analyses for one particular target can also be easily applied to other related targets). Among the datasets that might be most applicable are:

- HydroSHEDS/GLoRIC for mapping rivers
- HydroLAKES for mapping lakes
- GIEMS-D15 or the Global Surface Water Explorer for wetlands.

Some additional recommendations for using these datasets are made below.

1) <u>Minimum or maximum extent of wetland coverage</u>

Wetlands vary in size seasonally with wet and dry periods, and from one year to another. The inundation parameter selected for an analysis of protected area coverage will have implications for the result; for instance, a map of minimum inundation extent would result in a smaller denominator, and therefore a higher percentage coverage, as compared to using a map of maximum inundation extent. The objective is to protect the diversity of wetland habitats and the ecological functions these habitats support, hence it is important to be inclusive of the range of areas that are inundated on a regular basis, without encompassing exceptional flood extents that go beyond wetland systems. For these reasons, the mean annual maximum inundation extent of the wetland is recommended as the best measure. (Note that the GIEMS-D15 dataset is well suited for this, because it includes measures of (1) mean annual minimum, (2) mean annual maximum, and (3) a long-term maximum.)

2) Global vs national datasets and their applications

The application of global data to national scales can create problems of under- or over-representation of water bodies, especially in the case of modelled rivers and streams. Where possible, maps derived from global datasets should be refined using regional, national, or sub-national data and expertise. However, where such refinements are not possible, possible sources of error and likely effects on coverage calculations should be acknowledged .

3) Human-made inland wetland systems

In the section on Extent of area-based protection (above) it is concluded that any site that has been identified as a human-made area should be initially included in the overall assessment of extent of protection (with a complementary calculation that removes human-made systems, for deeper analysis.) Therefore, the same rule should be applied to defining what ecosystems are included in assessing the overall extent of inland water systems.

4) Inland waters used as area borders or boundaries and other marginal protections

There are examples of inland water systems that are included within protected areas whose ecosystems can be significantly modified or threatened by actions external to the protected area; for example, rivers that form the border of protected areas, or inland waters that are adjacent to dams outside the protected area. However, excluding these systems becomes more complex. At present, these inland water systems should be included in the assessment of total protection but noting them as regions that may require urgent conservation attention (See 'Future Work and Considerations' for further discussion).

Future work and considerations

Discussions around a near-term, basic methodology for measuring the extent to which inland waters are included in protected and conserved areas have also identified several recommendations for refining this process in the future. These include the following points.

Update point data with polygon data

As noted above, the WDPA and the Ramsar Sites Information Service (RSIS) include only point data for some protected areas. The current buffer approach may be more or less acceptable at the national/global level but is inappropriate for more detailed site-by-site analysis. Protected areas that are only represented by point data should be revised to include full polygon data.

Distinguish between human-made and natural ecosystems

A priority for the future will be to ensure there is a consistent method in spatial data sets for coding inland waters as natural or human made. An increasing number of datasets allow for spatially explicit identification of reservoirs.[271] Additionally, the human-made group should be broken down into different categories (e.g., following IUCN's 'Artificial Aquatic' habitat typology), making it possible to evaluate the relative protection importance of different human-made structures and systems, and to filter out those that are clearly not contributing to biodiversity protection.

An important part of that future work will be to set decision-rules for defining when an ecosystem that has previously been modified by humans might be considered to have enough characteristics to be accepted as a natural system. For example, historical drainage in parts of the world mean that inland waters now rely on essentially human-created systems (e.g., in the UK, Norfolk Broads, Somerset levels, gravel pits in the Trent Valley).

Unusual changes in wetland extent

Wetlands will show seasonal changes in maximum extent due to natural causes, but wetland extent (and the proportion that is protected) can also be affected by anthropogenic factors, such as climate change, water use, development, etc. One potential way to address this in the future will be to integrate SDG 6.6.1 as a complementary indicator that can account for these additional changes.

Exclude rivers that form borders of protected areas

Rivers that run along the borders of protected areas are not effectively protected, because they may be significantly affected by human activities on the opposite side of the river to the area of protection. Hence, a possible option for the future is to exclude 'boundary' river reaches from calculations of protection coverage (although these can also be prime areas for expansion of a protected area).

Exclude extent of riverine ecosystems within protected areas and affected by dams

Inland waters that include dams, and that are within protected areas may be significantly affected by those dams, in terms of modified flow quantities, water temperature, and sediment load. Consequently, their ecosystems are not protected, in practice, despite being within the protected area. Therefore, in future analyses there may be a reason to exclude these areas from an assessment of total coverage of inland waters.

Similarly, inland water ecosystems that are upstream or downstream of existing or planned dams, but are within protected areas, may not be protected in practice, and will require more detailed analysis in the future. However, there are also examples of protected areas that are adjacent to or even include dams or other in-stream infrastructure that continue to support native freshwater biodiversity. Therefore, carefully crafted decision rules will need to be developed for addressing this issue.

Align the WDPA and the Ramsar Sites Information Service (RSIS)

Spatial data on Ramsar sites are available in the WDPA and the Ramsar Sites Information Service (RSIS), but there may be some mismatches between the RSIS dataset and the data that are submitted to the WDPA by individual countries. The Ramsar Secretariat and UNEP-WCMC are in discussions on how to better align the data and reporting mechanisms of the RSIS and WDPA.

Add an 'Inland Water' field in the WDPA and WD-OECM

The WDPA and WD-OECM currently lack information to determine whether protected and conserved areas include inland waters, with the default of lumping inland waters with terrestrial areas. It is recommended that inland water areas are calculated and tracked separately from terrestrial areas, and that the delineation between marine and inland waters is applied more consistently. Given that many sites will contain both terrestrial and inland waters, the "inland water" category would be selected often. As with marine systems, a method could be developed that distinguishes whether the site was designated and is managed primarily with inland water ecosystems and biodiversity. Currently the classification of marine areas is based on an estimate of the distance inland to which marine influence is likely to extend and may include some parts of the lower courses of rivers and coastal wetlands that are also considered to show characteristics typical of inland waters.

Defining area extent for non-spatial protection mechanisms

There are several important types of protection of inland waters that are not specifically area based. Examples include national decrees, or agreements based on environmental flow requirements (for further examples see Higgins et al., 2021; Perry et al., 2021). Because they are not spatially defined, they are not included in this discussion of how to assess protection coverage for inland waters. However, they could be included in the future, and a goal for further refinement of the methods presented here should be to create a set of criteria for defining a spatial extent to these non-area-based protections (e.g., defining the river lengths or wetland areas that must be protected in order to achieve the non-spatially defined protection mechanism).

Improve existing datasets and identify other potential datasets

Some of the most commonly used datasets for measuring protected and conserved areas, and inland water extent are discussed above and in Table Y. However, there are some other datasets that already exist, are in development, or are planned, that could be useful. Individual countries may have more extensive national or regional spatial datasets for inland water surface extent that are more accurate and an objective for the future should be to find ways of improving global datasets, and/or calibrating them to national and regional datasets.

In addition, the list of options continues to grow given exponential growth in both data availability and alternatives for processing large datasets at high spatial resolution. A few additional datasets identified during expert workshops include:

- MERIT Hydro – global flow direction maps[272]
- GWD-LR – Global width database for large rivers[273]
- UNEP-DHI Global Hydrological model - dataset for rivers assembled from 20 years of data, giving good global coverage at basin level (developed for SDG 6)[274]
- UNEP-DHI - Global Map of wetlands, currently not disaggregated by wetland type, to be developed to show change in extent of wetlands (developed for SDG 6)[275]
- GLoRiC: Global Intermittent Rivers and Ephemeral Streams (GIRES);[276] tool for global monitoring of river health with the emphasis on the biophysical state.[277]

An important consideration for any dataset used is that it is reviewed and revised regularly, so that it properly addresses the increasing rate of ecological change in inland water systems due to the effects of climate change, human water use etc.

Recommendations for measuring effectiveness.

In parallel to rolling out an approach for measuring protection coverage of inland waters using data available today, a consortium of organizations and experts will be developing a vision for what will be required to measure effective inland waters protection by 2030 and charting a pathway for achieving that vision. This is expected to include a recommendation for the delineation and validation of a globally comprehensive set of inland waters Key Biodiversity Areas (KBAs). Target 3 contains a component indicator for areas of high biodiversity importance, as measured by KBAs, but terrestrial KBAs do not adequately capture the distinct biodiversity of inland waters.

Effective protection must also account for the role of connectivity in supporting functioning inland waters systems. For that reason, a measure of connectivity should be incorporated into the post-2020 Global Biodiversity Framework, not only for Target 3 but also for Target 2 and Goal A. An indicator already exists in the form of the connectivity status index (CSI),[278] which measures the global status of river connectivity across several axes (lateral, longitudinal, vertical and temporal) and includes a methodology to apply the index at multiple scales.

A recommended set of indicators for inland waters

Given the 30 per cent target, area coverage will be a critical component of any indicator set aimed at capturing information about the state of inland waters. But it will not be the only one: the target addresses many components, including issues relating to ecological representation, connectivity, conservation effectiveness, rights and equity. Discussions are still ongoing about a realistic indicator set for 30x30, and inland waters will need to be integrated into this wider discussion. Table 4.3 proposes recommended headline and component indicators of the GBF to represent inland waters in the area-based targets.

Table 4.3: Proposed additions **(in bold)** to headline and component indicators for the Post-2020 Global Biodiversity Framework

Goal/Milestone/ Target	**Component**	**Headline Indicator**	**Component Indicator**
Goal A	Connectivity of natural ecosystems		**Connectivity status index (CSI; replacing River Fragmentation Index, currently listed as a complementary indicator)**
Target 2.	Extent of degraded river ecosystems under restoration		Length of degraded river habitat under restoration (using CSI degradation threshold)
Target 3.	Area protected and conserved	**Inland waters** coverage of protected areas and OECMS	
	Areas of particular importance for biodiversity protected and conserved		Protected area coverage of **inland waters/freshwater Key Biodiversity Areas**
			Protected area coverage of free-flowing rivers, as measured by CSI

The protection of inland waters will take many forms, some of which will be area-based. While some existing area-based protections have been designed specifically to conserve inland waters, most are primarily designated for terrestrial objectives and some for marine objectives. Currently, we have a limited set of tools for ascertaining how well area-based protections are benefitting inland waters, and there are many ways in which we can potentially improve on this, through revising the way we use existing tools, or developing new data sets and associated tools. However, conservation of inland waters is urgently needed. Decision-makers need immediate guidance on where and how to focus their efforts, and there is not time to wait for perfect datasets to measure extent of protection.

Section 5. Conclusions and key considerations

These considerations synthesize key points from Sections 1-4 and build from the Guiding Resources presented in Box 4, Section 3. They are currently in outline form and will be revisited and revised in 2023 as the document is developed into a technical implementation guide.

1. **All inland waters are important, however small or currently degraded, and should be better protected and conserved**.

2. **To meet the goals of the post-2020 GBF, including reversing the trends of nature and biodiversity loss, implementation of the post-2020 GBF – and specifically 30x30 – *must* include inland water ecosystems and their dependent biodiversity**. This includes the goals of coverage as well as measures of effectiveness. A baseline and progress should be tracked and measured through appropriate indicators and reported at the global scale by 2030.

3. **Full advantage should be taken of existing and planned investments across global treaties and commitments when designing protected and conserved area networks.** In many cases, implementation can support goals across multiple national commitments and related investments. These include the Ramsar Convention on Wetlands, UN Sustainable Development Goals, UN Framework Convention on Climate Change, the Convention on Migratory Species, UNCCD Land Degradation Neutrality target, UN Decade on Ecosystem Restoration, among others.

4. **Areas designated originally to protect terrestrial and marine values have been demonstrated to enormously increase freshwater biodiversity conservation *if* they are located, designed and managed appropriately**. Therefore, some of the effort in conserving inland waters should be directed towards improving their representation in the management plans of terrestrial or some coastal reserves.

5. **Systematic conservation planning across biomes is important to ensure that both new and existing protected areas and OECMs deliver effective inland water conservation**. Such planning needs to be participatory, efficient, effective and of sufficient size and configuration to connect key elements of the waterscape, maintain biodiversity and climate resilience.[279,280]

6. **Equity, inclusion and supporting Indigenous Peoples and local communities.** Design, designation and management must include free, prior and informed consent (FPIC) as a formal requirement for projects impacting Indigenous Peoples and more generally for any relevant stakeholders. Initiatives should prioritize models of Indigenous- and community-led conservation, co-management and benefits sharing. Community engagement and Traditional Ecological Knowledge (TEK) should be included at the earliest stages of scoping including identification of values, indicators, monitoring and management.

7. **A broad range of mechanisms can provide the opportunity to align conservation needs with suitable policy tools at the appropriate scales.** Mechanisms for protected areas like national parks and biosphere reserves can deliver important conservation benefits for inland waters depending on their location, design and management. Application of OECMs is just beginning in many places

and governments and others are learning what can be included and the implications of recognizing an OECM. Given the importance of inland water resources to humans and nature, investments should be made in clarifying guidance for inland water OECMs, possibly through a task force of the WCPA freshwater specialist group.

Protected areas and OECMs are powerful instruments for inland water conservation but need to be supported by sustainable management and restoration through the rest of the landscape. This will include, for example, reducing external and internal pressures from inappropriate, illegal or unregulated land and water management, pollution, land use change and where necessary restoring both inland water ecosystems and supportive management approaches in surrounding lands.

8. **Improving representation across inland waters ecosystem types.** Emerging area-based approaches for protection and conservation, like migratory swimways and fluvial reserves should be incentivized to improved representation of under-protected ecosystem types like large rivers and lakes. Additionally, measures should track representation globally (e.g., freshwater ecoregions of the world).

9. **Monitoring, evaluation, adaptation and learning to understand effectiveness** for freshwater conservation outcomes. Indicators need to be chosen by a range of stakeholders in a participatory process, have thresholds agreed along with prior plans for potential actions if thresholds are exceeded. Indicators need to consider a range of values, biological, social etc.

10. **Complement area-based designations with environmental standards to support critical inland water ecosystem processes and conditions and improve effectiveness**. This can include:
    - Minimum or optimum environmental standards for incorporation into existing management plans and new designations to clarify the inland water biodiversity objectives.
    - Within the defined geographic boundary, including narrative standards at a minimum, and quantitative standards as needed. As discussed in section 3 these can be articulated for environmental flows, water quality, connectivity, physical habitat and biotic integrity.

11. **Sustainable financing – ensuring that projects have both sufficient funds to cover initial start-up costs and funds, or secure access to funds, for implementation over time.** Options include a variety of:
    - Public funding
    - Major funding inputs (Project Finance for Permanence schemes/Enduring Earth)
    - Ecotourism investments
    - Payments for ecosystem services (climate and water funds)
    - Compensation for environmental damage
    - Payments for coexistence
    - Market approaches – certification schemes etc.
    - Tax incentives
    - Green investment market

Appendix 1: Assessment of management effectiveness

The following section provides some more detail about the choices needed in deciding approaches to assessing management effectiveness and using the results.

Big data or adaptive management?

There are two main reasons for looking at management effectiveness,[281] and when looking at options it is important to decide whether this is primarily an information-gathering exercise to build data on the global/national status of PA management effectiveness or whether it is aimed principally at improving management on site: there is a trade-off.

Big data puts a priority on standardising indicators and processes to maximise comparability. This means an agreed method and way of assessment applied to all protected areas in a country and, ideally, all protected areas globally to allow comparable reporting against the GBF targets. Application on this scale probably means reducing the indicators down to a relatively small number to find out whether some important elements of management are in place and to capture key aspects of the ecological and social outcomes of conservation based on data availability. Global monitoring systems will often draw on different kinds of data from site level assessments, including remote sensing imagery.[282] Somewhere between 8-15 indicators would be a maximum; there is a long history of more elaborate systems being abandoned after a short period. This type of assessment will provide a quick snapshot of progress but it will only provide quite limited information of the detail needed to improve management.

Site-level or even a national level assessments focused on improving management effectiveness should be more flexible, encouraging local adaptation, which however reduces the ability to compare globally. In this scenario, there would be many different systems operating, depending on local needs, wants and resources. There are three main reasons for encouraging local adaptation:

1. Any one system is unlikely to be equally applicable in every situation; needs change with geographies, cultures and history. Particularly if dealing with stakeholders unused to assessment processes, the inclusion of questions that are not relevant to the local conditions can create a negative reaction or waste a lot of time.

2. The inclusion of many different people thinking about a system, rather than simply using a pre-determined system, leads to continual refinement; in effect a crowd-sourced assessment system. So long as someone is monitoring the changes, this also means that the “central” assessment system can continue to be improved over time.

3. At a psychological/cultural level a proportion of stakeholders like to stamp their own personality onto the tool; this is often attractive to governments and thus encourages sustained uptake. Tools and processes imposed from outside are more likely to be abandoned.

This doesn’t mean the two approaches cannot be combined; for example, a core set of “monitoring questions and data” could be incorporated into more systems aimed at site-level management improvement, as long at the former are also capable of being applied independently to a larger number of sites. There are already a plethora of tools (Table #) aimed mainly at improving management on a site, some (like the METT) have also been used for tracking progress more generally, with mixed success.

Table A.1: **Some management effectiveness tools**[283]

Tool	**Aim**	**Time required**	**Details and notes**	**Strengths**	**Weaknesses**
Management effectiveness tracking tool (METT)[284]	Rapid assessment of management	Low (1-2 days)	Simple, multiple-choice questionnaire, ideally done by PA staff and other stakeholders, deciding by consensus. Ramsar has developed an R-METT for inland waters	Quick to apply, driven mainly by expert opinion, creates list of action points.	Weak on outcomes – variations exist using more data.
Protected Area Benefits Assessment Tool (PA-BAT)[285]	Assessment of social benefits from protected areas	Low (1 day)	Works with stakeholders to identify what they value from a PA, actual and potential, and where and when benefits accrue.	Quick method to identify what communities value from a protected area.	May miss "global values" like carbon.
Social Assessment of Protected Areas (SAPA)[286]	Assessment of social impacts of protected areas	Low (1-2 days)	System for working with local rightsholders and stakeholders to assess the impact of a protected area on their livelihoods.	Focuses on social impacts and human communities.	No data on effectiveness from an ecological perspective.
Governance Assessment for Protected and Conserved Areas[287] (GAPA)	Assessment of governance quality of protected areas	Medium	Methodology for assessing governance quality, aimed at mangers and a wider group of stakeholders, working together	Uses a combination on interviews, workshops and an optional site-level scorecard.	No data on ecological effectiveness or wider social impacts.
Green List of Protected Areas[288]	Setting standards for protected areas	Medium	Global standards against which to measure management, verified by third parties.	Detailed management standards.	Relatively time and money expensive.
Conservation Assured	Setting standards for species in protected areas	Medium	Verified standards aimed at particular species or groups, so far for tigers,[289] jaguars and river dolphins.	Suitable for priority species and tailored to their needs.	Relatively time and money expensive.
Enhancing our Heritage toolkit[290]	Detailed assessment of management	High (several days, long-term monitoring)	Developed for UNESCO natural World Heritage, has 12 different toolkits, for a comprehensive monitoring system	Detailed toolkit for sites needing particular attention.	Time needed, linked to detailed monitoring.
SMART[291]	Monitoring system for PA rangers	Daily use	Monitoring system to record animal sightings, poaching, traps found etc	Helps build data, also builds competencies of rangers.	Requires basic training and equipment, management.

There are fewer tools designed specifically for monitoring targets, although several have been used in this way. The METT was designed for tracking progress on an individual site over time and already has a number of national or regional variations – there are distinct versions in Bhutan, Indonesia, Myanmar, South Africa etc. The METT is used for monitoring by the Global Environment Facility and has been used many times to develop global data comparisons because there is a large associated dataset, but it is not what this tool was designed for.[292]

Elinor, a new assessment system that combines elements of MEET and SAGE,[293] was developed primarily to track WWF projects globally and will therefore be used in standard format; it also focuses down on a smaller number of questions. It is relatively untested as yet.

There is also considerable work ongoing to link tools, particularly if they focus on different issues: there have been discussion on cooperation between SMART and METT, to see if hard data can be amalgamated smoothly into the largely qualitative approach in the METT. There are also continuing discussions and about linking METT and SAGE, drawing attention to the growing need for all assessments to pay greater attention to social issues than has often been the case in the past.

Currently, there are efforts to consider management effectiveness in the framework of the Global Biodiversity Framework, including proposals from the UK Defra[294] and from UNEP-WCMC.[295] Discussions are ongoing.

Apart from the R-METT, a version of the METT designed by Ramsar for inland waters,[296] there has been comparatively little attention paid to freshwater systems as compared to terrestrial or marine protected areas. Further thought is probably required, about both assessment for adaptive management and monitoring, with regard to whether an existing system can be used as it is or whether it is worth considering a new system developed especially for the biome.

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