THE BENEFITS OF RESTORING RIVERS AND WETLANDS

A BRIEFING PAPER
2026

FRESHWATER CHALLENGE

IUCN

CONSERVATION INTERNATIONAL

Wetlands INTERNATIONAL

This paper provides a summary of the benefits that society gains from restoring rivers and wetlands. It's based on the findings of a technical report commissioned by WWF[1] (Benefits of Wetlands Restoration | WWF), which summarised existing scientific evidence from long-term, large-scale freshwater ecosystem restoration initiatives around the world (see map on page 9)

WHY HEALTHY RIVERS AND WETLANDS ARE IMPORTANT

Rivers and wetlands have always given us so much more than water. Through the ages, they have shaped civilisations as much as they have shaped landscapes. We have relied on them for food, transport, water, energy and building materials. We have worshipped them as places of inspiration, power and life. For most of our history, we have been dependent on rivers and wetlands. Now they need us.

When rivers and wetlands are healthy, they deliver many benefits that underpin water and food security, and build climate resilience. However, since 1970 the world has lost a third of its healthy wetlands and we've seen a shocking 85% decline in freshwater wildlife populations, the worst of any habitat type.

As wetlands and rivers deteriorate, we lose many of the goods and services they deliver. This is a tragedy that presents material risks to human wellbeing, economic development and international water security. Impacts are driven by over-abstraction of water, modification and fragmentation of water flows owing to dams and other built infrastructure, land-use change, pollution, aquatic invasive species, over-harvesting and climate change.

Most countries have already committed to protect and restore freshwater ecosystems, for example through the Ramsar Convention on Wetlands and the landmark Kunming-Montreal Global Biodiversity Framework. But progress towards these goals has been too slow and we continue to lose wetlands faster than forests. There are signs of hope: initiatives like the Freshwater Challenge, anchored in intergovernmental policy in July 2025 at the Convention on Wetlands' COP15, call for urgent changes in policy and financing to accelerate the restoration of freshwater ecosystems.

[1] Speed, R., Gippel, C., Volmer, D. and Tickner, D. (2026) Societal benefits of large-scale river and wetland restoration, WWF-UK, Woking, UK

WHAT IS ECOSYSTEM RESTORATION?

Restoration involves repairing or rejuvenating degraded ecosystems. It is often not possible to restore an ecosystem to its pristine state, but improvements in the health of rivers and wetlands can still bring benefits. Freshwater ecosystems may be restored by re-establishing natural flows of water, removing physical barriers to flow such as obsolete dams and drains, eliminating alien species, changing agricultural practices to reduce pollution from fertilisers and run-off, replanting riparian zones, reconnecting rivers to their flood plains, and regulating fishing to sustainable levels.

WHAT BENEFITS DO RESTORED FRESHWATER ECOSYSTEMS PROVIDE?

Freshwater ecosystems provide habitat for rich biodiversity and are among the world's most productive ecosystems for human wellbeing. When restored to good health, rivers and wetlands can regulate floods and droughts, recharge groundwater, support fisheries, provide drinking and irrigation water, and support food and fibre production. They can also store carbon, filter and dilute and diminish pollution. For hundreds of millions of people worldwide, healthy rivers and wetlands underpin cultural and economic values including recreation, ecotourism, religious and spiritual practices.

These benefits mean they are critical natural solutions for both climate adaptation and sustainable development, in all regions. It has been estimated that freshwater and marine wetlands provide services to people worth more than US$36 trillion per year worldwide.

RESTORED FRESHWATER ECOSYSTEMS AND THEIR BENEFITS

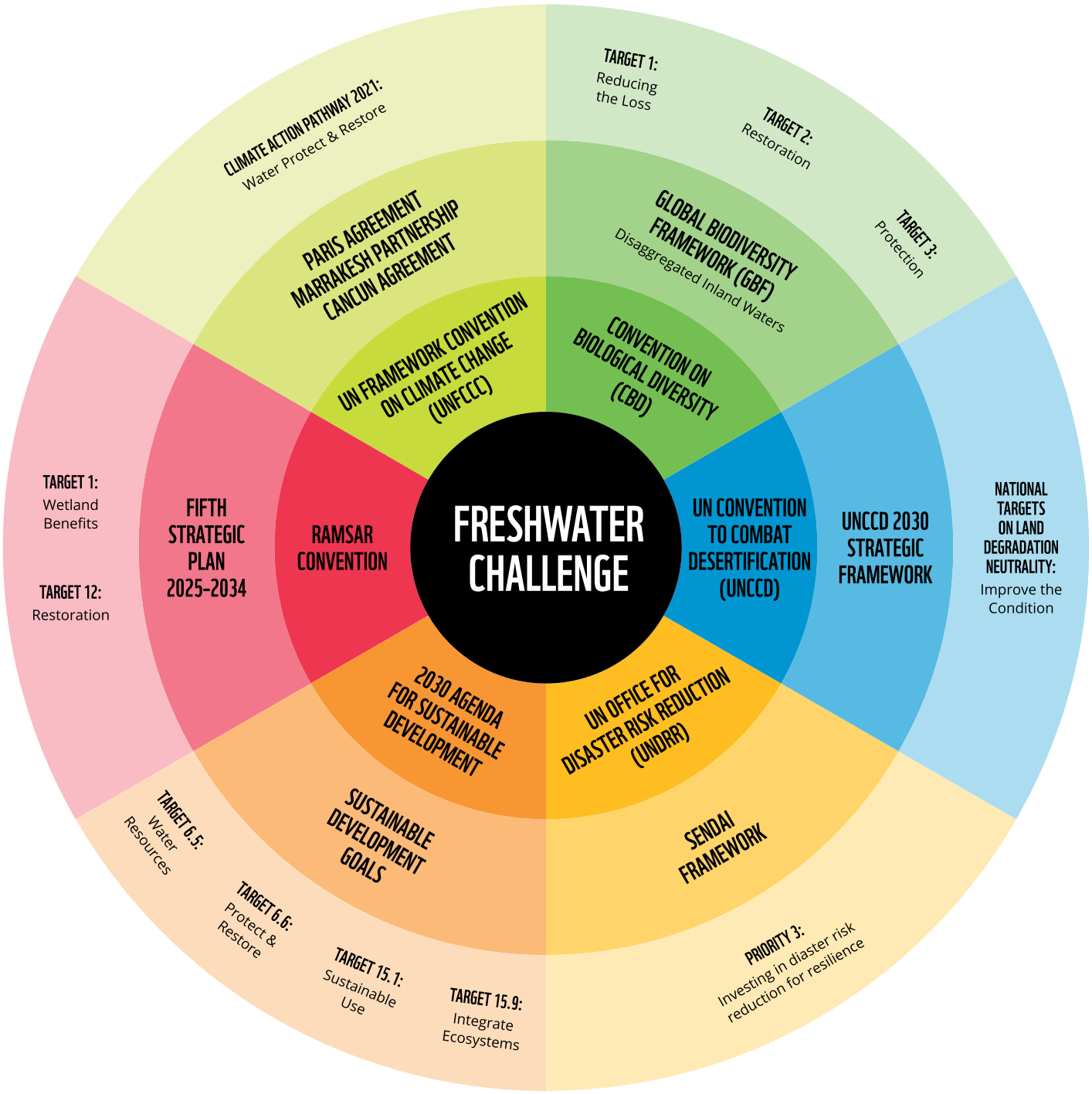
- **A** Reforested headwater catchments supporting downstream river flows
- **B** Flows of water to downstream users and habitats restored
- **C** Fishing for food (with nets) in free flowing, unobstructed rivers
- **D** Healthy rewetted peatlands trapping carbon
- **E** Wetlands adjacent to rivers absorbing flood waters
- **F** Healthy clean rivers with birds, plants, fish and people playing
- **G** Floodplains protected as a buffer against urban flooding
- **H** Wetland and reforested riparian buffers around the river, filtering run-off and pollutants

Restoring freshwater ecosystems can contribute simultaneously towards national water and food security, disaster mitigation and nature's recovery. It also contributes towards the goals of a wide range of international environmental agreements, including the UNFCCC, UNCCD, UNCBD, SDGs, Sendai Framework, and the Convention on Wetlands[2].

There is also growing recognition across the private sector of the importance of maintaining ecosystem health to underpin healthy and prosperous economies. A growing pool of both private and public funds is available for investment in ecosystem restoration, including those related to carbon abatement. Likewise, there is increasing momentum for climate policies to include finance for Nature-based Solutions (NbS), including river and wetland restoration, as a cost-effective way of adapting to the unavoidable impacts of climate change.

[2] UN Framework Convention on Climate Change, UN Convention to Combat Desertification, UN Convention on Biological Diversity, UN Sustainable Development Goals, Sendai Framework for Disaster Risk Reduction 2015-2030, Ramsar Convention on Wetlands

THE FRESHWATER CHALLENGE IN GLOBAL UN CONVENTIONS AND COMMITMENTS



The Freshwater Challenge is a country-led global initiative which aims to accelerate and support the restoration and protection of freshwater ecosystems. It's activities are relevant across different global Multilateral Environmental Agreements (MEAs), as shown here. Restoring rivers contributes to meeting the SDGs as well as reducing disaster risk and contributing to the Global Biodiversity Framework. Countries meet multiple targets and commitments when they prioritise river and wetland restoration.

HOW CAN POLICY MAKERS ACCELERATE RIVER AND WETLAND RESTORATION?

1. Budget and finance ministries

- Bring freshwater ecosystem restoration and protection options into mainstream decision making in key departments (water, agriculture, land, fisheries, infrastructure, urban planning). This should be done by explicitly accounting for the multiple benefits restoration can bring.
- Mobilise blended finance for restoration. Create incentives for private sector investment and green bonds targeting river and wetland restoration.
- Prioritise cost-effective NbS. Fund restoration as an alternative to expensive grey infrastructure (for example, flood control or water treatment), considering operation and maintenance costs, climate resilience, and co-benefits.
- Integrate restoration into national budgeting. Include ecosystem restoration in climate and infrastructure investment plans, especially for water and food security and disaster risk reduction.

2. Water supply

- Restore catchments to secure water yield. Implement riparian and floodplain management and restoration to boost dry season river flows and groundwater recharge.
- Protect water source catchments. Promote restoration of upstream riparian and hillslope forests to reduce water treatment costs and improve drinking water quality.
- Plan for drought resilience. Use river and wetland restoration to improve natural water storage and safeguard water security in the face of climate uncertainty.

3. Ecosystems and biodiversity

- Embed restoration targets for rivers and wetlands in national biodiversity strategies, including environmental flows, improvements water quality, hectares of restored catchment and riparian areas, kilometers of free-flowing rivers, numbers of dams and barriers removed, abundance and diversity of freshwater species.
- Protect intact ecosystems. Prioritise free-flowing rivers and functional wetlands for conservation.
- Ensure river and wetland restoration priorities are also explicitly linked to and mentioned in forest, degraded land, estuaries and coastal restoration plans, and vice versa.
- Strengthen monitoring and adaptive management. Invest in long-term tracking of river and wetland health and catchment condition, indicators of including biodiversity, river flows and water levels, water quality, pollutants, habitat extent, etc.

4. Climate change response

- Use river and wetland restoration for resilience. Incorporate catchment restoration, floodplain reconnection and wetland rewetting into national climate adaptation and disaster risk management plans.
- Use river and wetland restoration for climate mitigation. Promote peatland rewetting and wetland restoration as natural carbon sinks where science indicates that this is possible.
- Integrate river and wetland-related NbS into Nationally Determined Contributions (NDCs). Ensure restoration is recognised in climate commitments under the UNFCCC Paris Climate Agreement.

5. Catchment management

- Adopt integrated basin-scale restoration. Combine river channel restoration, floodplain reconnection, and riparian zone protection with environmental flow implementation, pollution reduction, headwater reforestation and the removal of invasive species for maximum benefits.
- Engage communities early. Implement co-management models for catchments, rivers and wetlands and for managing fisheries and other aquatic resources.
- Address trade-offs proactively. Balance restoration with other priorities to ensure socially just outcomes, including through compensation, local community led stewardship, indigenous peoples custodianship and environmentally sustainable economic development models.

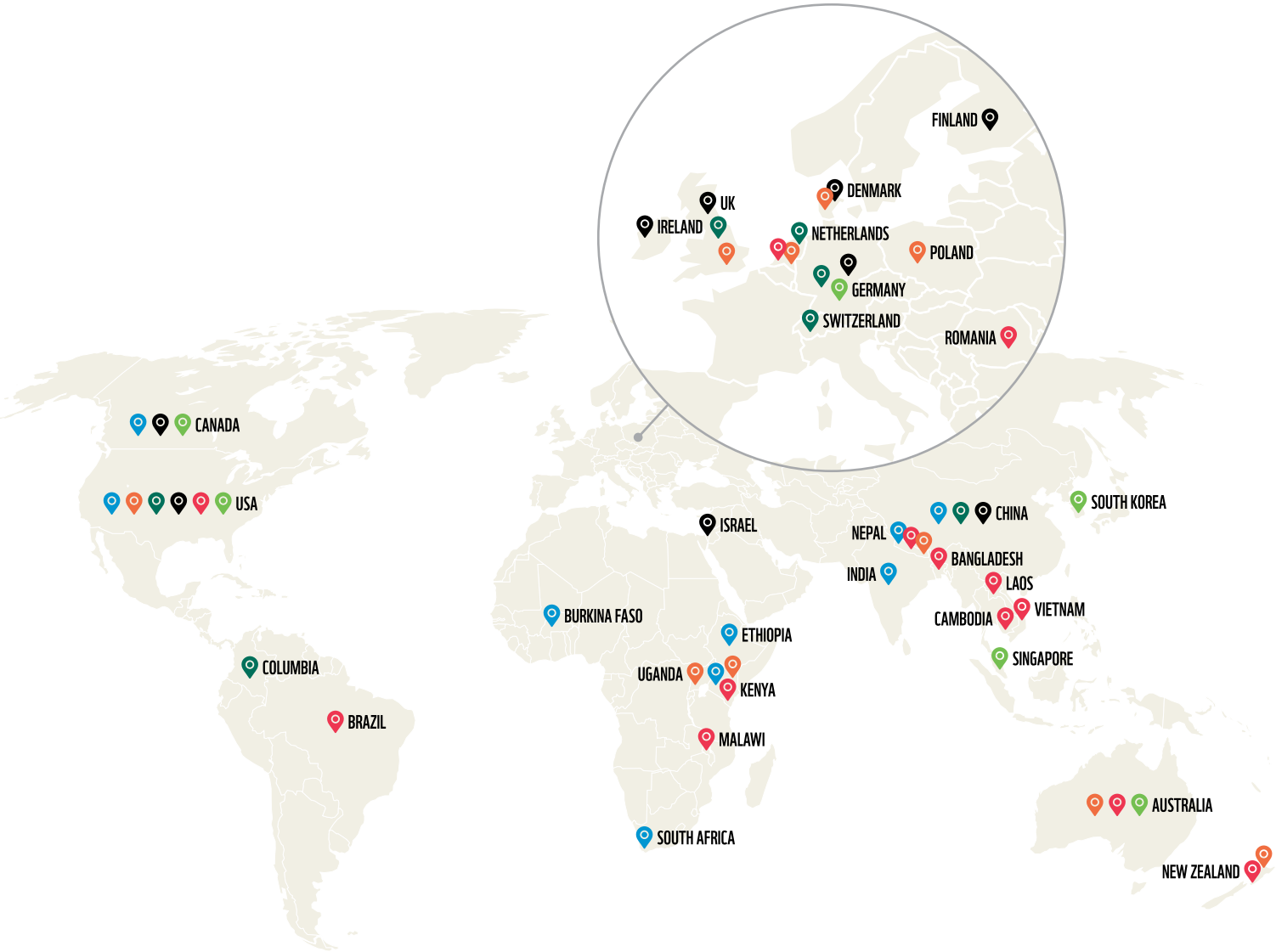
6. Health and wellbeing

- Improve water quality for public health. Use wetland restoration to reduce pathogens and pollutants in sources of drinking water.
- Enhance recreational and cultural spaces. Promote river, lake and wetland restoration for mental and spiritual health, recreational use and community wellbeing, particularly in urban areas where freshwater habitats are accessible to more people.
- Reduce disaster risk. Use river and wetland restoration to lower flood-related stress, injuries and illnesses.

7. Defence and security

- Reduce disaster vulnerability. Integrate floodplain and wetland restoration into transboundary and international disaster risk reduction strategies.
- Safeguard water and food security. Ensure restoration supports fisheries and water supply in climate-stressed regions, domestically and with international neighbours.
- Mitigate conflict risks. Use restoration to reduce resource scarcity tensions, particularly in transboundary river basins, and to catalyse international cooperation and peace-building.

RIVER AND WETLAND RESTORATION BENEFITS – CASE STUDY COUNTRIES



- WATER SUPPLY BENEFITS
- WATER QUALITY BENEFITS
- FLOOD RISK REDUCTION BENEFITS
- CARBON/GHG FLUX BENEFITS
- FOOD SECURITY BENEFITS
- CULTURAL & RECREATIONAL BENEFITS

Explanatory notes: Markers indicate where scientific case studies found in our literature review showed quantitative evidence of societal benefits from large-scale river and wetland restoration. Locations are accurate to country level only, and do not show precise locations of rivers or wetlands. Scientific papers that presented evidence of benefits at international or global scales are not shown in this graphic.

THE BENEFITS OF RESTORING RIVERS AND WETLANDS: SELECTED EXAMPLES

This table provides a summary of the benefits of restoration. For source references and for full list of examples drawn from the science literature, see accompanying technical report: Speed, R., Gippel, C., Volmer, D. and Tickner, D. (2026) *Societal benefits of large-scale river and wetland restoration*, WWF-UK, Woking, UK.

RIVER AND WETLAND RESTORATION CAN...

Enhance water supply

- A review of global case studies demonstrated substantial increases in recharge from infiltration basins and wetland restoration, in the magnitude of 200-500mm/year.
- In South Africa, removing invasive riparian vegetation increased annual water yield by 34.4 million cubic metres, about 42% of the output of a new dam and for less than 20% of the cost per cubic metre.

Reduce pollution

- In a global review of 88 freshwater restoration projects (not including Africa), 80% of projects reviewed demonstrated enhanced ecosystem services – specifically improved water quality and retention of nutrients.
- In a global meta-analysis, water quality in around 34% of freshwater systems returned to baseline conditions once anthropogenic nutrient sources were removed.
- Conservation and restoration of rivers and their catchments enabled New York City to avoid spending US$8-10 billion on a filtration plant and US$365 million a year in treatment costs.

Reduce flood risks

- A nationwide study in the US found that US$1 invested in floodplain restoration today can avoid about US$5 in future flood losses.
- In a systematic review of more than 20,000 studies worldwide, 71% found NbS for flood mitigation to be cost-effective for disaster reduction.
- River and wetland restoration in the Yangtze basin, China, have resulted in an increased floodwater retention capacity of 8 billion cubic metres, lowering flood risk for tens of millions of residents.

Boost carbon storage and reduce greenhouse gas emissions

- It has been estimated that restoration globally across 355-484 million hectares of wetlands can sequester 3-9% of current global carbon emissions.
- Global-scale reviews and modelling show that restoring wetland (including peatland) can prevent significant CO_2 emissions, can sequester over one billion tonnes of CO_2 a year, and can cut the net warming potential of wetlands by more than 60%.
- Numerous rewetting projects in Europe show consistent reductions in CO_2 emissions and avoided losses, though methane emissions often rise temporarily. Benefits grow over decades, with rewetted peatlands shifting towards carbon sinks.

Improve food security

- In Bangladesh's Hail Haor wildlife sanctuary, managed fish refuges and seasonal closures of the wetland increased fish catch by about 88% and raised fish consumption among poorer households.
- In Malawi, community-managed fish refuges increased observed fish species richness by approximately 24%.
- On the Brazilian Amazonian floodplains of the Juruá and Purus river systems, lakes that have been subject to improved management hold substantially larger populations of arapaima (a key food fish) than open-access waters, and lakes show co-managed by local communities show higher catches and fisher revenues.

Improve cultural and recreational values

- Restoration of an urban park in Singapore saw annual visitor numbers to the park double from around three million to six million.
- Decommissioning a dam and establishing a wetland reserve in Victoria, Australia led to double the numbers of visitors for walking, cycling, birdwatching and canoeing.
- A US$10 million investment in restoring Muskegon Lake in Michigan resulted in total local economic benefits of US$60 million through increased tourism and raised property values.

Reinvigorate biodiversity

- Partial reflooding of the Waza–Logone floodplain in Cameroon produced large increases in waterbirds, with species-level gains of 135-744%. It expanded the typical annual flood extent by about 1,000-1,500 sq km.
- Wetland restoration at Ichkeul National Park in Tunisia has supported wintering populations of 100,000-200,000 birds in typical years, and up to 300,000 in some years.
- At East Dongting Lake (middle Yangtze River, China), floodplain restoration through changes to dykes yielded higher wintering waterbird richness, density and diversity.

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