

GLOBAL STRATEGY FOR FUNGAL CONSERVATION

Integrating fungi into conservation policy and practice

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Photo: Stephen Axford

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Foreword



At a time when the world must accelerate action for nature, climate and people, we need approaches that bring together efforts across countries, sectors and disciplines. The Global Strategy for Fungal Conservation offers an important contribution to this work, providing a framework for coordinated action that supports countries in meeting their broader biodiversity commitments.

Fungi are fundamental to the health and resilience of ecosystems. They sustain soils, enable nutrient cycling and support the survival of countless plant and animal species. Yet despite their essential role in nature, fungi remain overlooked and underrepresented in conservation policy, research and funding. Protecting biodiversity means recognising the importance of all forms of life, including those that are less visible but no less vital.

This strategy is an opportunity to address that imbalance. By bringing together governments, scientists, Indigenous peoples, local communities and conservation organisations, we can strengthen the knowledge, partnerships and action needed to conserve fungal diversity.

The Global Strategy for Fungal Conservation reminds us that effective conservation must embrace the full diversity of life on Earth. Its success will depend on our collective commitment to turning that recognition into meaningful action.

Razan Khalifa Al Mubarak
President, International Union for Conservation of Nature (IUCN)

Foreword

As hosts to Seventeenth meeting of the Conference of the Parties (COP) to the Convention on Biological Diversity (CBD), Armenia was presented with a unique opportunity to demonstrate leadership in real-word implementation of the Kunming-Montreal Global Biodiversity Framework (GBF). The CBD COP17 motto “Taking Action for Nature” emphasised the need for countries to join together and advance and amplify national efforts to address global challenges.

To do this we must, as the CBD concept states, use a “whole of society, whole of government” approach. But I believe this should be expanded to include a “whole of organisms” approach. This would allow us to mainstream not only plants and animals, but also fungi and other overlooked groups, into policy and action, ensuring inclusiveness not only at the societal level, but also through species and ecosystems.

This new Global Strategy for Fungal Conservation (GSFC) has been developed to support this mainstreaming. It calls on governments, funders, researchers, businesses and communities to recognise fungi as a vital part of nature and include them in conservation action. This first-of-its kind global framework for fungi shows how countries, when delivering action for fungi, can meet the global nature targets they have already agreed on – from protected areas and restoration to species recovery, sustainable use, and climate action.

But a global strategy only works if countries act on it and integrate it into National Biodiversity Strategies and Action Plans, legislation, and monitoring. This is where the Strategy can make a difference; it is designed to be adapted to each country's capacity and emphasises that action can start even with limited fungal data.

Armenia shows what this can look like. Our Red Data Book first included fungi in 2010, and we are now assessing more fungal and lichen



species. The Armenian National Targets and National Biodiversity Strategy and Action Plan emphasize the sustainable harvest, use, and trade of fungal species, establishment of the invasive fungal official list and DNA barcoding, inventory of edible fungal species. Armenia has also signed the Fungal Conservation Pledge, demonstrating the country’s leadership in recognizing fungi as a fundamental component of biodiversity, ecosystem functioning, and climate resilience.

As Parties review their progress at COP17 and plan the years ahead, I hope they will use this Strategy as a practical guide and comprehensive information source for fungi conservation – not only to protect fungi in their own right, but also to ensure they continue to support the plants, animals and people that depend on them.



Dr. Arsen Gasparyan
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Photo: Stephen Axford

Introduction

Fungi are integral to maintaining the health of our planet, supporting people, and sustaining all life on Earth[1].

It is therefore essential to integrate fungi into efforts to combat the triple planetary crisis of climate change, pollution, and biodiversity loss. This Strategy provides the framework needed to advance the inclusion of fungi into the global conservation agenda, not only to effectively protect and restore fungal diversity worldwide but also the species and ecosystems that depend on them.

Fungi are a vast kingdom of life with an estimated 2.5 million species[1] found in terrestrial, freshwater, coastal, marine, and transitional ecosystems, in both wild and urban spaces. They maintain essential processes such as nutrient-carbon cycling, decomposition, and water quality regulation. Most plants and many animals rely on them for survival, and through their numerous interactions with organisms across other kingdoms, fungi influence ecosystem functioning as a whole. Furthermore, fungi have significant economic importance as well as spiritual and cultural value. At least 1,500 species are used by people all over the world, including Indigenous Peoples whose traditional knowledge of fungi represents an irreplaceable cultural and scientific resource[2]. The sustainable use of fungi maintains food security and supports livelihoods from local, traditional, and foraged consumption to large industrial-scale agriculture. Fungi are also an important source of medicine, such as antibiotics, vaccines, and other pharmaceuticals. In industry, they are essential for the production of biofuels, enzymes for detergents, and food additives like citric acid, as well as fermentation processes involving yeast and the creation and breakdown of plastics. Certain species can also support the bioremediation of contaminated environments, including sites polluted by organic materials, petroleum, pharmaceuticals, and pesticides[1].

Despite their importance, fungi remain largely understudied and overlooked. While some groups are relatively well known (e.g., mushroom-forming species), overall less than 10% of species in the Kingdom Fungi are formally described, and less than 1% have been assessed in the IUCN Red List of Threatened Species. Of those assessed species, over 30% are categorised as threatened[3]. Despite facing significant and increasing pressures, fungi are rarely included in conservation policy and action, notably in biodiversity-rich regions, largely due to disparities in taxonomic expertise and data availability, coupled with a lack of coordination and limited institutional resources and funding. Conservation initiatives, typically designed for plants and animals, frequently fail to protect fungi, and may fall short of their objectives when fungi are not considered.

Encouragingly, fungi are increasingly being included in legal protection and site designations, restoration projects, and sustainable use efforts in a growing number of countries and regions. Furthermore, new tools are making it more feasible to document fungal diversity at scale, e.g., community science, morphological identification, and molecular methods like metabarcoding and eDNA analysis are helping to fill gaps in under-sampled regions and among cryptic or microfungal groups.

For over a decade, there has been increasing recognition that fungi need to be better integrated into policy, practice, and biodiversity mainstreaming. For example, in 2012, the International Union for Conservation of Nature (IUCN) members adopted a Resolution calling for "Increasing the attention given to the conservation of fungi"[4] and, in 2014, Pouliot et al. argued that it was "time for a global strategy for plant and fungus conservation"[5]. More recently, at the 12th International Mycological Congress in Maastricht, the Netherlands, in 2024, the mycological community agreed to develop a strategy for the conservation of fungi that would facilitate the incorporation of fungi into national and global conservation policies and actions. Subsequently, experts in the global mycological community from institutions across the world mobilised as the Global Fungal Conservation Network (GFCN) to present the importance of fungal species for achieving the Kunming-Montreal Global Biodiversity Framework (GBF) at the 16th meeting of the Conference of the Parties (COP) to the UN Convention on Biological Diversity (CBD) in Colombia[6]. This was the precursor to the development of the **Global Strategy for Fungal Conservation** (GSFC).

< 1%

of fungal species have been assessed in the IUCN Red List of Threatened Species



Photo: Sarah shuttleworth / Plantlife

Purpose

The purpose of this Strategy is to catalyse the urgent and effective conservation of fungi through policy, practice, and delivery. It encourages the integration of fungi into science and community-based conservation efforts to halt and reverse biodiversity loss and ensure fungi are used sustainably and equitably for the benefit of people.

Vision

A world in which fungi are recognised, understood, and conserved as a fundamental and irreplaceable part of life on Earth, and in which their diversity, functions, and relationships are protected and utilised for the benefit of biodiversity, ecosystems, and people.

Taxonomical and ecological scope

Fungi are a Kingdom of life found in every environment on Earth, equivalent to Kingdoms Animalia and Plantae. Fungi occur in all continents, across terrestrial, inland water, coastal, marine, and transitional systems, as well as in human-modified landscapes and urban environments. They can be unicellular or multicellular and function as free-living decomposers, mutualistic symbionts, predators, or pathogens. This Strategy was developed to cover the entire Kingdom of Fungi and, therefore, its implementation should include all groups of fungi across all ecosystems. Additionally, the Strategy can be applied to groups of fungus-like organisms that belong to other kingdoms traditionally studied by mycologists, including water moulds and slime moulds.

This Strategy is the first dedicated global framework for fungal conservation, filling a gap that no existing international agreement or biodiversity strategy has addressed. It does not prescribe specific management actions or legal requirements, but rather calls for coordinated action and provides a shared framework and set of priorities to support governments, non-governmental organisations, academic institutions, funding bodies, and other organisations in integrating fungi into conservation policy, planning, implementation, research, and investment decisions. It is designed to be flexible so that it can be adapted to different national capacities and contexts, and to existing frameworks such as National Biodiversity Strategies and Action Plans (NBSAPs). Where appropriate, the GSFC can also be used to guide and inform a dedicated national fungal strategy. Crucially, even where fungal data are limited, meaningful action remains possible (see ‘Implementing the GSFC’).

The GSFC has been developed to enable countries to achieve their conservation goals and implement global frameworks. It does this by underscoring the multifaceted role fungi

can and must play in global conservation and sustainability efforts. This Strategy is closely aligned with the GBF, the international agreement adopted at CBD COP15.

The GBF sets out a long-term vision extending to 2050, supported in the short-term by 23 overarching targets, encompassing issues related to habitat protection and restoration, species recovery, equitable and sustainable use, climate change, and the benefits of biodiversity to people[7]. The CBD obligates signatory parties to protect, restore, and use biodiversity in a sustainable and equitable way, guided by the GBF's targets.

The Strategy also builds on the Fungal Conservation Pledge, launched by the Governments of Chile and the United Kingdom at CBD COP16, as an international commitment made by countries to recognise and integrate fungi as an independent kingdom of life in national and international legislation, policies, and agreements. The two work hand in hand to advance fungal conservation, with the Strategy providing the framework for integrating fungi into conservation efforts, thereby supporting the implementation of the GBF and guiding on-the-ground action.

While this Strategy is designed to align closely with the GBF to facilitate its practical adoption, it stands independently as an authoritative reference for integrating fungal conservation priorities into conservation instruments and efforts, and its implementation extends beyond the GBF and reaches actors who may not be directly engaged with that framework. For example, the GSFC also:



Photo: Petra + Werner Eimann Kaarst

- Contributes to the implementation of the UN Sustainable Development Goals, including those related to life on land and below water, climate action, and sustainable consumption and production.
- Aligns with the International Initiative for the Conservation and Sustainable Use of Soil Biodiversity, the UN Convention to Combat Desertification (UNCCD) and the Ramsar Convention by recognising the central role fungi play in soil and aquatic systems integrity and ecosystem restoration.
- Complements the Global Strategy for Plant Conservation (GSPC), which has shown how a kingdom of life can be mainstreamed into global conservation policy, recognising that fungi and plants are distinct but ecologically interdependent kingdoms whose conservation is most effective when their respective communities work together.
- Upholds the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) by advocating for the sustainable and legal trade of wild fungal species.
- Supports the UN Framework Convention on Climate Change by emphasising the importance of fungi in carbon cycling, climate mitigation, and ecosystem resilience.
- Aligns with principles of customary international environmental law, which sets forth obligations for states to abide by e.g., the principles of prevention, no harm, due diligence, and to conduct environmental impact assessments (EIA)[8].

Incorporating fungi into conservation policies and actions is essential not only to protect fungi as a vital part of biodiversity, but also to protect the plants and animals they associate with, the ecosystem services they provide, and their economic and cultural benefits to people. The achievement of targets related to ecosystem restoration, climate resilience, food security, and biodiversity conservation can all be strengthened through explicit incorporation of fungi.

Fundamentally, concerted and collective action – a "whole-of-society approach" – will be needed for the vision of this Strategy to become a reality. Policymakers, conservation practitioners, researchers, mycologists, community scientists, Indigenous Peoples, local communities, funders, industries, and businesses should seek to integrate fungi into biodiversity and climate priorities and recognise them as critical for ecosystem functioning and human well-being, and as potential nature-based solutions.



Photo: A. Sandor / Szeged Fungus Association

GSFC approach

The actions detailed in this Strategy include the vital steps to conserve fungi and effectively include them in conservation initiatives. They are voluntary and complementary to the GBF, can be adapted to different national priorities, do not require additional reporting by countries, and facilitate non-state actor engagement.

While fungal knowledge has increased significantly, a global deficit of information can still impede conservation action and management, and, for many fungal groups, the practices, protocols, and tools needed to deliver conservation actions are still being developed. However, these knowledge gaps should not prevent fungal conservation action according to the CBD's precautionary approach: *"Where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat"*[9].

Within each GBF target, the Strategy sets out GSFC Actions that can be progressed through existing policies and practice, and GSFC Research and Infrastructure Priorities that identify the knowledge, tools, and resources needed to enable and strengthen those actions. The actions and the research and infrastructure priorities within each target are related, with a single priority often supporting several actions, and some priorities underpinning actions across multiple targets.



Photo: Mycosphaera



The relationship between actions, priorities, and the foundational resources that support them

While fungi are important for achieving all 23 GBF targets, the GFCN identified 12 for which they are particularly essential. This Strategy provides actions and research and infrastructure priorities for all targets related to reducing threats to biodiversity (targets 1–8), most of the targets on meeting people's priorities through sustainable use and benefit-sharing (9–11), as well as capacity-building and/or cooperation as a critical tool and solution for implementation and mainstreaming (target 20).

Foundational resources

This Strategy highlights a critical need for enhanced data and infrastructure, particularly the incorporation of fungal information into tools for organising and sharing taxonomic and distribution data. Priorities include well-curated, digitised, sequenced, and searchable fungaria, living collections, and biobanks, as well as developing and updating comprehensive species profiles, integrated with a global catalogue of fungi and with associated genomic and sequence data. This includes sustaining what already exists, including collections at risk of loss, the shared databases the field depends on, and biobanking and cryopreservation capacity. These collections provide historical baselines and reference material to support the systematic documentation, preservation, monitoring, and application of fungal biodiversity[10]. These foundational resources are specified in the research and infrastructure priorities for target 4, but are also needed for the successful implementation of most targets.

Implementing the GSFC

A strength of the GSFC lies in the flexibility of its implementation. Prioritisation and phased implementation pathways (short-, medium-, and long-term actions) based on national context should be considered, recognising that the full set of actions and associated research and infrastructure priorities may be challenging to implement simultaneously, particularly in countries with limited taxonomic capacity, baseline data, and long-term funding.

Signatory countries to the GBF have already demonstrated their commitment to protecting biodiversity, including fungi, and the close alignment of the GSFC actions to the GBF targets enables countries to meet this commitment without additional obligations. The GBF provides a set of enabling conditions and considerations for its implementation that must be woven into every action for this Strategy to succeed. These include:

- **Integrating Indigenous Peoples and local communities and promoting gender equality** (GBF targets 22 and 23): Recognising and respecting the rights, knowledge, and traditional practices of Indigenous Peoples and local communities, and women in particular, is fundamental. Their active involvement in conservation, from spatial planning to sustainable harvesting, is crucial for equitable and effective outcomes. Engagement with and use of their traditional knowledge must be based on free, prior and informed consent and mutually agreed terms, consistent with the Nagoya Protocol.

- **Ensuring data and knowledge are available and accessible** (GBF target 21): Evidence-based action depends on filling knowledge gaps on fungal diversity, distribution, ecology, conservation status, use, and trade, and on making the resulting data, information, and knowledge accessible to decision-makers, practitioners, and the public, including through public-facing institutions such as botanic gardens, zoos, and museums.

- **Capacity-building and training** (GBF target 20): It is critical to strengthen the capacity of governmental agencies, non-governmental organisations, academic institutions, and civil society to advance fungal conservation, including training and support for early-career researchers and students, particularly in regions where fungal diversity remains poorly documented. This includes training in fungal identification, biology, and ecology, as well as different monitoring techniques and equitable sustainable management practices focusing on both people and policy.

- **Interdisciplinary and interregional collaboration** (GBF target 20): Effective fungal conservation requires a collaborative approach involving mycologists, botanists, zoologists, ecologists, social scientists, conservation practitioners, farmers, businesses, policymakers, and local stakeholders. Equally important is the development, access and sharing of information and technology across different regions, including through South-South, North-South, and triangular cooperation.

- **Mobilising resources and sustained funding** (GBF target 19)**:** Continued dedicated investment and sustainable funding in research and fungal conservation action are essential for the implementation of this Strategy across all targets.

- **Mainstreaming fungi into decision-making** (GBF target 14)**:** The success of this Strategy depends on integrating fungi into broader biodiversity, climate, and sustainability policies, regulations, planning, and development processes across all levels of government and all sectors.

- **Integrating fungi into urban ecosystems** (GBF target 12): Urban green and blue spaces, including parks, urban forests, botanical gardens, brownfields, and community-managed areas, provide important fungal habitats and are key settings for education, outreach, restoration, and public participation in fungal conservation. Incorporating fungi into biodiversity-inclusive urban planning helps connect people with fungal diversity in the most populated areas.



Photo: G. Schuster / DGfM

This Strategy can be tailored to each country's domestic priorities with practical and scalable actions that complement national circumstances, capacities, and resources. A useful first step is to prioritise actions to fit within NBSAPs which countries are using to deliver their GBF commitments and which provide a readily available framework for integration. Existing organisational strategies and relevant programmes can also be used to map where the actions can practically contribute to aims and objectives, helping to streamline both planning and delivery.

For countries with limited fungal data or taxonomic infrastructure, often in the most biodiverse regions, a practical entry pathway is to focus on a small set of foundational actions. Documenting and cataloguing fungal diversity, securing voucher specimens and living cultures in collections, and accelerating extinction risk assessments provide the baseline knowledge on which spatial planning, species recovery, and monitoring all rely. Much of this baseline data can be built through existing survey and monitoring efforts, drawing on community science and a combination of field and laboratory methods suited to the fungal groups and resources available. Additionally, standardised surveys, long-term monitoring, and open-access, interoperable databases will steadily fill darkspots, cryptic diversity, and underrepresented taxa. Increased capacity-building and close coordination between researchers, conservationists, governments, and funders can accelerate this progress and improve how data are accessed and used, so that they can be translated into effective policy and action.

Meaningful action where species-level data are incomplete can include protecting areas of likely high fungal diversity and the habitats and functional groups that sustain it, alongside initiating national fungal inventories and integrating fungi into existing assessment and planning work.

For the fungal groups where the necessary conservation practices and tools are still being developed, implementation can build from pilot and demonstration projects towards larger-scale action as methodologies mature. Monitoring the outcomes of these actions over time, and adapting them as knowledge improves, will be critical to strengthening delivery across all targets and quickly responding to change.

For monitoring and reporting, countries need simple, measurable indicators. Using standardised indicators, together with the technical assistance and training provided by UN agencies and international organisations, improves efficiency. Where possible, fungi should be integrated into the GBF's existing indicators, and into other multi-taxon biodiversity monitoring programmes. This will be more efficient than establishing separate schemes and supports the production of comparable data over time.

As with the implementation of the GBF, a whole-of-government and whole-of-society approach will support effective delivery of actions. Key stakeholders include national focal points for fungal conservation, often housed within existing biodiversity offices; lead institutions such as national museums housing biodiversity collections, environment ministries, and universities; regional coordination bodies such as the African Mycology Network and European Mycological Association; and the GFCN, which can provide global guidance and support. This shared responsibility relies on behaviour change among the many people whose decisions affect fungi, including farmers, foragers, traders, travellers, and consumers. Designing interventions that address the barriers and enablers to adopting fungus-friendly practices, from reducing demand for products from threatened fungal populations to changing practices that spread invasive species, helps translate awareness and commitment into action.

Learning from existing practice

Fungal conservation is already underway in many countries and sectors, providing tested approaches that can be adapted to other contexts and support delivery of this Strategy. Legislative protection, community-based sustainable harvesting, restoration that accounts for fungal communities and applications of fungal biotechnology show the diversity of approaches, geographies, and sectors in which fungi are already playing, or could play, a transformative role. These experiences offer practical starting points that can be adapted to national circumstances, and they help identify the conditions under which particular approaches succeed.

Implementation can also draw on tools and resources that already exist, both within mycology and in conservation more broadly. Assessment and monitoring standards, spatial planning tools, data platforms, guidance on species recovery and sustainable use, and established funding mechanisms were largely developed around plants and animals, but most can accommodate fungi with modest adaptation. Integrating fungi into these tools, and into the institutions and processes that use them, is generally quicker and more durable than building parallel systems. Integration also strengthens recognition of fungi as a fundamental component of the nature-based solutions, ecosystem services, and sustainable development pathways that the GBF seeks to advance.



Photo: Garry Lotulung / SPUN



Photo: Shaneya Miriyagalla

A selection of case studies, tools, and resources has been compiled to support this work and is available in the Annex and at globalfungalconservation.org. It is not exhaustive and is intended to support governments and civil society in integrating fungi into their biodiversity and climate priorities, alongside general conservation resources that can be used by the mycological community. Practitioners, policymakers, researchers, businesses, funders, and the wider civil society are invited to draw on these examples, adapt them to their own contexts, and contribute new case studies and resources, so that the collection continues to grow as implementation progresses.



Photo: Stephen Axford

01

GBF OBJECTIVE 1

Reducing threats to biodiversity



Targets 1 to 8 address the direct drivers of biodiversity loss. For each one, the Strategy sets out why fungi matter to meeting the target, the actions countries can take, and the research and infrastructure needed to support them.

1

GBF TARGET 1

Plan and manage all areas to reduce biodiversity loss

Ensure that all areas are under participatory, integrated and biodiversity inclusive spatial planning and/or effective management processes addressing land- and sea-use change, to bring the loss of areas of high biodiversity importance, including ecosystems of high ecological integrity, close to zero by 2030, while respecting the rights of Indigenous Peoples and local communities.

Rationale to include fungi

Identifying and protecting hotspots of high fungal diversity and endemism are essential to ensuring the ecological integrity of ecosystems, and need to be part of integrated and biodiversity inclusive spatial planning and management efforts.

GSFC actions

1.1. Integrate fungi into global, regional, and national spatial planning efforts.

i. Prioritise areas of high ecological integrity, functioning, and fungal diversity and endemism for spatial planning and/or effective management.

ii. Integrate fungal data into existing spatial assessment and planning frameworks, such as the IUCN Red List of Ecosystems and the identification of KBAs.

iii. Include fungal spatial data that takes into account both formally named species and OTUs obtained through complementary morphological, molecular, and other biodiversity survey data.

Research and infrastructure priorities

1a. Develop standardised guidelines for surveying, analysing, interpreting, and visualising fungal biodiversity data, drawing on complementary morphological, molecular, and other approaches, ensuring appropriate integration into spatial planning efforts.

1b. Investigate whether specific indicator fungal species or communities can be used to identify high-quality habitats.

1c. Identify hotspots of fungal diversity and endemism, high ecological integrity and functioning, as well as knowledge gaps (darkspots) and ecological networks and corridors that allow fungal species to adapt to climate change, with the goal of incorporating information into existing spatial assessment and planning frameworks, such as the IUCN Red List of Ecosystems and the identification of KBAs.

1d. Refine protocols and develop guidelines for incorporating fungi into spatial assessment and planning frameworks such as the IUCN Red List of Ecosystems, KBA criteria, and environmental and social impact assessments, including when fungal

GSFC ACTIONS CONTINUED

1.2. Include fungi in biodiversity management processes.

i. Apply management practices tailored for fungi, maintaining the habitat conditions, continuity, and disturbance regimes on which different functional fungal groups depend.

ii. Integrate fungi into effective management processes and environmental and social impact assessments.

PRIORITIES CONTINUED

surveys should be triggered, adequate survey effort and timing, and how fungi contribute to assessing ecosystem status and significance of impact.

1e. Prioritise sampling efforts at sites potentially facing higher threat levels, and/or geographic, ecological, functional, and taxonomic darkspots to address knowledge gaps and improve modelling accuracy.

1f. Investigate the congruence of fungal diversity with animal and plant species that are already the focus of conservation spatial planning and management to inform the effectiveness of current practices on fungal conservation.

1g. Identify best practices and develop guidelines for managing different fungal groups and habitats within wider spatial planning and management processes, including urban areas and outside formally protected areas.



Photo: Dr. Shiva Devkota

GBF TARGET 2

2 Restore 30% of all degraded ecosystems

Ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and marine and coastal ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity.

Rationale to include fungi

Fungi play a crucial role in sustaining terrestrial, marine, and freshwater ecosystems, with most plants depending on fungal species for their survival and saprotrophic fungi driving the decomposition that channels carbon and nutrients into detrital food webs in soils and water. The integration of fungi into restoration efforts is important for the successful establishment and persistence of plants, and to improve biodiversity, ecosystem functions and services, ecological integrity and connectivity.

GSFC actions

2.1. Integrate critical functional groups of fungi into existing restoration and rewilding programmes, plans, and standards, so that fungal recovery supports their effectiveness and wider ecosystem recovery.

i. Assess presence, richness, community composition, biomass, abundance, and drivers of change of critical ecological fungal groups in the area of interest, its surroundings, and comparable reference sites.

ii. Implement science-based active restoration interventions and augmentation efforts of critical ecological fungal groups as needed, employing local inoculum and/or locally adapted fungal species/strains.

Research and infrastructure priorities

2a. Identify fungal species and communities key to ecosystem functions and services, ecological integrity, and connectivity; and continue to generate and analyse data on fungal diversity and distribution in protected, undisturbed, and remnant areas, together with temporal datasets, to establish appropriate baselines, improve understanding of natural and managed communities, and inform the reference models used to guide restoration.

2b. Develop fungal bioindicators and global indices to measure the integrity of aquatic and terrestrial systems and the ecosystem services provided by fungi, and to monitor ecosystem recovery and functional restoration success over time.

2c. Research how different restoration practices impact fungal diversity, community composition, function, and connectivity, as well as what connectivity means for fungal diversity and dispersal limitations at different restoration scales and contexts.

GSFC ACTIONS CONTINUED

2.2. Promote the effective restoration of key areas for fungal diversity as part of the 30% global target.

i. Integrate fungal data into the decision-making process for identifying priority restoration sites.

ii. Restore degraded priority areas for fungal diversity, community composition, function, and connectivity, monitor recovery against those same attributes, and implement appropriate adaptive management practices.

PRIORITIES CONTINUED

2d. Identify priority sites at the global, regional, and national levels for effective fungal restoration, integrating this information into existing and developing data repositories.

2e. Develop principles and guidelines to specifically promote fungal diversity, community composition, function, and connectivity, advising on the implementation of active versus passive restoration and how to integrate fungi in restoration and rewilding efforts to improve their effectiveness and promote climate resilience.

2f. Improve guidelines and protocols for inoculation, translocation, reintroduction, and population augmentation of fungal species, including biosafety and risk assessment, especially for soil translocations of multiple (and likely unknown) microbial species and non-native or selected strains, as well as monitoring protocols that measure plant performance and effects on native fungal communities, ecosystem services, and ecological integrity, and that help prevent invasion by non-native fungal species.

2g. Develop standardised survey guidelines that integrate complementary sampling approaches, together with rapid, cost-effective monitoring protocols and indicators of success over appropriate timescales, for restoration programmes specifically designed to reflect changes in fungal communities and functions, and inform adaptive management practices.



Photo: Stephen Axford

3

GBF TARGET 3

Conserve 30% of land, waters and seas

Ensure and enable that by 2030 at least 30 per cent of terrestrial and inland water areas, and of marine and coastal areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures, recognizing indigenous and traditional territories, where applicable, and integrated into wider landscapes, seascapes and the ocean, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, recognizing and respecting the rights of Indigenous Peoples and local communities, including over their traditional territories.

Rationale to include fungi

Considering the role of fungi in ecosystem functioning and services, their inclusion is crucial for the identification of areas of particular importance for biodiversity and ecosystems, not only in terrestrial but also in freshwater, coastal, marine, and transitional water environments. This is particularly relevant since more than 90% of hotspots of mycorrhizal fungal richness are not protected and areas that are considered less significant for animal or plant species, such as the temperate boreal zones, may in fact be hotspots of fungal diversity or ecosystem service provision[11].

GSFC actions

3.1. Promote the inclusion of fungal species of conservation concern and cultural importance in decisions on which areas should be effectively conserved and managed.

i. Integrate fungal data into existing formally designated protected areas and areas of particular importance for biodiversity, such as KBAs.

ii. Include fungi in efforts to expand protected areas as part of the 30x30 initiative, ensuring population connectivity and integrity, and taking into account both formally named fungal species and OTUs, and, where these are limited, using habitats and host species as proxies for likely fungal presence.

Research and infrastructure priorities

3a. Document and analyse fungal diversity in existing formally designated protected areas, OECMs and other areas of particular importance for biodiversity, such as KBAs, and evaluate the effectiveness of these areas in protecting fungal diversity, endemism, and ecological integrity.

3b. Identify areas of high ecological integrity, functioning, connectivity, and high fungal diversity and/or endemism that should be prioritised for effective conservation, taking into account current and future climate and land-use scenarios.

3c. Develop guidelines on how to integrate fungi into different types of areas of particular importance for biodiversity.

GSFC ACTIONS CONTINUED

3.2. Integrate fungi into sustainable management and monitoring plans in formally designated protected areas and OECMs, ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes for fungi, recognising and respecting the rights of Indigenous Peoples and local communities, including over their traditional territories.

i. Apply integrated management practices tailored for fungi.

ii. Monitor the effectiveness of site management practices in conserving fungal species and/or communities, and adapt them accordingly.

PRIORITIES CONTINUED

3d. Identify best practices, including traditional knowledge and practices of Indigenous Peoples and local communities, and develop standardised guidelines that are integrated with overall site management and target different groups of fungi and habitats, including survey and monitoring protocols to assess the effectiveness of protected areas and their management practices in conserving fungi.



Photo: Alexander J. Bradshaw

GBF TARGET 4

4 Halt species extinction, protect genetic diversity, and manage human-wildlife conflicts

Ensure urgent management actions to halt human induced extinction of known threatened species and for the recovery and conservation of species, in particular threatened species, to significantly reduce extinction risk, as well as to maintain and restore the genetic diversity within and between populations of native, wild and domesticated species to maintain their adaptive potential, including through in situ and ex situ conservation and sustainable management practices, and effectively manage human-wildlife interactions to minimize human-wildlife conflict for coexistence.

Rationale to include fungi

While relatively few fungal species have been assessed on the IUCN Red List of Threatened Species, over 400 are listed as threatened[3]. Urgent recovery actions are needed for those species at higher risk, to prevent their extinction as well as the extinction of other species that depend on them and the associated loss of ecosystem functioning and services.

GSFC actions

4.1. Promote the effective conservation, management, and restoration of threatened fungal species using integrated in situ and ex situ approaches, aiming to achieve genetically diverse and viable populations.

i. Integrate fungi into national, regional, and global Red List initiatives and species-protection legislation by increasing efforts to assess the extinction risk of priority groups of fungi.

ii. Prioritise biobanking efforts focused on developing and maintaining genetically diverse ex situ collections of known threatened fungal species and other fungi of conservation concern, preferably in the country of origin.

iii. Develop and implement recovery plans for known threatened fungal species and other fungi of conservation concern, including reintroduction from *ex situ* collections where appropriate, and where broader habitat and threat-based measures are insufficient.

Research and infrastructure priorities

4a. Increase efforts to document, map, and describe fungal diversity and resolve taxonomic issues.

4b. Develop and maintain a comprehensive species profile platform integrated with a continuously updated global and regional catalogue of fungal species, including information on ecology, hosts, distribution, at least at the country level, and existing extinction risk assessments at national and regional levels.

4c. Develop and implement a strategy to select a subset of species that are taxonomically, geographically, and ecologically representative of the estimated total diversity of fungi for prioritisation of extinction risk assessments and integrate new tools to accelerate generating and publishing extinction risk assessments of fungal species.



Photo: Petra + Werner Eimann Kaarst

PRIORITIES CONTINUED

4d. Refine protocols and guidelines for assessing fungal species for the IUCN Red List of Threatened Species and IUCN Green Status of Species, including adding recommendations on incorporating molecular-based biodiversity data, covering standard protocols for naming OTUs, validation requirements, optimal sampling strategies, and workable assumptions for applying DNA-based data to population metrics.

4e. Research the aspects of species' biology and ecology needed to enhance recovery efforts; develop and implement protocols to estimate population structure, dynamics, and genetic diversity within species; and evaluate the loss of genetic diversity in threatened fungal species and other fungi of conservation concern through genetic, genomic, or proxy assessments, contributing fungal data to genetic diversity indicators.

4f. Develop guidelines for implementing single or multi-species recovery plans for threatened fungal species and other fungi of conservation concern, including protocols to prioritise species that are in urgent need of recovery action.

4g. Develop and maintain a regularly updated database of threatened fungal species and other fungi of conservation concern held in ex situ collections, recording number of accessions and provenance, hosting institution, propagation protocols, and use policies; prioritise threatened and unaccessioned species for new accessions, ensuring genetically diverse representation; and continue advancing biobanking and reintroduction protocols to improve long-term viability and enable material to be returned to the wild.

5

GBF TARGET 5

Ensure sustainable, safe and legal harvesting and trade of wild species

Ensure that the use, harvesting and trade of wild species is sustainable, safe and legal, preventing overexploitation, minimizing impacts on non-target species and ecosystems, and reducing the risk of pathogen spillover, applying the ecosystem approach, while respecting and protecting customary sustainable use by Indigenous Peoples and local communities.

Rationale to include fungi

Almost every culture treasures fungi for food, traditional medicine, trade, or biotechnological development. Many of these fungal species are harvested mostly from the wild, and it is critical to ensure their sustainable, legal, and equitable use. Sustainable harvesting and ethical trade are essential to protect both the local communities that depend on fungi and the ecological services they provide.

GSFC actions

5.1. Promote the sustainable use, harvest, and trade of fungal species.

i. Identify important fungal harvesting areas and secure their recognition and effective management within existing spatial planning, protected area, and OECM frameworks, in collaboration with Indigenous Peoples and local communities.

ii. Integrate Indigenous Peoples' and local communities' knowledge and traditional practices in the sustainable use of fungi and include gender-responsive measures to ensure women and youth can access and harvest useful fungal species.

iii. Monitor population trends, along with trade volumes and trends, of harvested and traded fungal species, and establish harvest quotas equitably and transparently co-developed with Indigenous Peoples and local communities.

Research and infrastructure priorities

5a. Refine criteria and metrics to define sustainable harvest of fungal species, compile data on useful wild fungi, harvesting rates, and sustainability, and assess the impact of existing certification programmes, incorporating findings into global use databases.

5b. Develop guidelines for ethical, equitable, and safe harvesting and trade practices for fungal species, including monitoring protocols that measure population trends and traceability, and certification standards of sustainability.

5c. Develop training resources and curricula that are culturally and regionally appropriate on sustainable harvesting, identification, and trade practices for fungi and assess the effectiveness of these programmes.

5d. Evaluate the role of women in fungal harvesting and analyse potential approaches to strengthen fungi-based value-added chains for the benefit of rural women.

GSFC ACTIONS CONTINUED

iv. Encourage business, particularly large and transnational companies, and the financial sector, to ensure fungal products come from ethical and sustainable sources, and to promote sustainable consumption patterns to reduce threats to populations of utilised fungal species.

v. Foster sustainable economic alternatives centred on fungi, including cultivation of native species and development of mycotourism programmes that promote sustainable livelihoods, considering the rights of Indigenous Peoples and local communities.

vi. Integrate fungi into national trade legislation and regulations and international agreements, such as CITES, and monitor regularly to ensure these measures are effective, support efforts to address illegal and unsustainable trade, and do not create barriers to sustainable use that conserves species and supports livelihoods.

PRIORITIES CONTINUED

5e. Develop strategies and guidelines for the identification, designation, protection, management, and monitoring of important fungal harvesting areas and ecosystems that maintain and protect local communities' and Indigenous Peoples' practices and livelihoods.

5f. Assess the effectiveness of current regulatory frameworks for fungal species trade, identifying gaps and proposing needed changes; identify priority fungal species for CITES nomination, compiling and analysing supporting data, including information on harvesting, marketing, trade volumes, and their impact on population viability; and develop identification resources to support local authorities, law enforcement, and regulatory agencies in identifying target species and disrupting illegal trade.

5g. Develop guidelines and continue advancing the cultivation of different groups of fungal species as a commercially profitable alternative to wild harvesting, incorporating measures to reduce the risk of pathogen spillover, potential new invasions, and genetic impacts on wild populations from the release or escape of cultivated strains.

5h. Develop market research and guidelines to assess the feasibility, impact, and best practices of mycotourism, including risk mitigation for species, Indigenous Peoples and local communities, and identify economic activities as alternatives to illegal and unsustainable trade of fungal species, specifying which species and populations would most benefit.



Photo: Dr. Shiva Devkota

GBF TARGET 6

6 Reduce the introduction of invasive alien species by 50% and minimize their impact

Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species on biodiversity and ecosystem services by identifying and managing pathways of the introduction of alien species, preventing the introduction and establishment of priority invasive alien species, reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 per cent by 2030, and eradicating or controlling invasive alien species, especially in priority sites, such as islands.

Rationale to include fungi

Many pathogenic fungi become invasive outside their native ranges, causing billions of dollars of damage annually[12]. In addition, a growing number of non-pathogenic fungal species have escaped, which not only displace native fungi, but also impact native plants and other organisms that associate with them. It is crucial to identify and prevent fungi from becoming invasive, and eliminate, minimise, reduce, and/or mitigate the impacts of existing invasions in both agricultural and natural systems.

GSFC actions

6.1. Develop strategies to prevent the introduction of invasive non-native fungi and to eradicate or control those already established, in order to eliminate or minimise their impacts on biodiversity and ecosystem services.

i. Establish appropriate policies, legislation, and regulations, and implement management efforts, including risk-based screening for high-consequence fungal pathogens, and measures to prevent introductions of other non-native fungi, prioritising action at sites especially vulnerable to invasive fungi.

ii. Integrate fungi into National Invasive Species Strategies and Action Plans to limit and control the spread of invasive fungal species introductions, including at national and multinational levels.

Research and infrastructure priorities

6a. Compile information on invasive fungal species using standardised methodologies, covering their ecological, social, and economic impact, geographical origins, potential future spread, and the effect of climate change on their distribution and phenology, with attention to range edges as a way to understand factors limiting invasion, and integrate this information into national and global invasive species databases.

6b. Identify common discrete, diffuse, accidental, and intentional sources and pathways of introduction and investigate the most effective, expedient methods for preventing new introductions of invasive non-native fungi.

GSFC ACTIONS CONTINUED

6.2. Build public awareness of the impacts of fungi as potential invasive non-native species in all ecosystems and create capacity to eliminate, minimise, reduce, and/or mitigate their impacts.

i. Build national capacity, including on biosecurity, monitoring, research, early and rapid eradication and management, and disseminate authoritative information on terminology, definitions, descriptions, and the ecological roles that introduced and invasive fungi take in new ranges.

ii. Promote interdisciplinary conservation research and communication, including efforts in local languages to raise awareness of both the negative and positive aspects of introduced and invasive fungi, and design interventions to change practices among key groups such as traders, travellers, and the horticultural sector.

PRIORITIES CONTINUED

6c. Develop standardised protocols and multinational applied guidelines for easily identifying introduced and invasive fungi, including proactive methods of early detection and better understanding of the genetic structure of natural populations to enhance the use of different tools to detect the origins and pathways of introduced fungi.

6d. Develop protocols for identifying sites especially vulnerable to invasive fungi, for example, by investigating ratios of native:introduced fungal species across all ecosystems using high-quality reference sites as a baseline, and compile lists of impacted habitats, identifying common characteristics to understand potential vulnerabilities.

6e. Assess the effectiveness of current regulatory frameworks related to invasive non-native fungi, identifying gaps and proposing needed changes, and develop evidence-based, sustainable management and eradication strategies and guidelines for invasive fungi, testing the effectiveness of control methods, for example, removal of host plants to address host-limited invasive fungi, or biocontrol involving mycoviruses.

6f. Develop authoritative information on the terminology, definitions, ecological role, and descriptions of introduced and invasive fungi.



Photo: Gregory Mueller

7

GBF TARGET 7

Reduce pollution to levels that are not harmful to biodiversity

Reduce pollution risks and the negative impact of pollution from all sources by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: (a) by reducing excess nutrients lost to the environment by at least half, including through more efficient nutrient cycling and use; (b) by reducing the overall risk from pesticides and highly hazardous chemicals by at least half, including through integrated pest management, based on science, taking into account food security and livelihoods; and (c) by preventing, reducing, and working towards eliminating plastic pollution.

Rationale to include fungi

Fungi are extremely sensitive to their environments, creating both risks and opportunities in relation to pollution. While high pollution levels can negatively impact fungal populations, certain species can be harnessed to monitor, reduce, and even mitigate or remediate environmental damage. The use of fungi in regenerative agriculture decreases fertiliser application by improving nutrient cycling and reduces the need for chemical pest control by improving crop resilience against pests and diseases; some species of fungi can also degrade organopollutants, plastic, and other pollutants[1].

GSFC actions

7.1. Integrate fungi into nature-based solutions to reduce and mitigate the risk and negative impact of pollution to levels that are not harmful to biodiversity and ecosystem functions and services.

i. Integrate fungi into national and regional plans, policy, regulation, or guidance to reduce and manage pollution from all sources, and into global research networks focused on bioremediation, biocontrol, biopesticides, and biofertilisers.

ii. Employ fungi to reduce pollution, especially through use in regenerative agriculture, hazardous material clean-up, and plastic breakdown, prioritising native or locally adapted strains where possible, and taking into account biosecurity risks and potential unintended ecological effects.

Research and infrastructure priorities

7a. Identify key fungal species and communities that can support efforts to reduce pollution through the sustainable use of fungi as biocontrol agents, biofertilisers, and bioremediation tools, and accelerate research on their utilisation.

7b. Develop guidance and tools and identify the best practices to integrate the sustainable use of fungi for reducing pollution from all sources, including protocols for assessing, minimising, and monitoring risk regarding releasing new species/strains, including genetic impacts on native fungal populations.

7c. Identify and collate information on the main damaging pollutants relevant to fungi and their impacts on species, communities, habitats, and ecological function, including mapping sources of pollutants that have the highest impact to identify the most at risk fungal areas and hotspots.

GSFC ACTIONS CONTINUED

7.2. Minimise the impact of pollution from all sources on fungal species, communities, and their habitats.

i. Develop and implement regional and national action plans to reduce pollutants impacting fungal species, communities, functions, and hotspots.

PRIORITIES CONTINUED

7d. Build upon existing research and develop standardised ecotoxicological protocols for assessing the sensitivity of terrestrial and aquatic fungi to pollutants, and develop guidelines on best practices for mitigating the impacts of different pollutants on fungal species, communities, and ecological function.



Photo: Stephen Axford

GBF TARGET 8

8 Minimize the impacts of climate change on biodiversity and build resilience

Minimize the impact of climate change and ocean acidification on biodiversity and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, including through nature-based solutions and/or ecosystem-based approaches, while minimizing negative and fostering positive impacts of climate action on biodiversity.

Rationale to include fungi

Fungi, which comprise up to half of soil biomass, make a significant contribution to carbon dynamics, both as symbionts and as the principal decomposers of dead organic matter. Underground fungal networks (mycelium) have a critical role in sequestering and storing carbon and potentially supporting the achievement of net-zero climate goals[13]. Fungi are also significant in marine systems, where they make up a substantial part of ocean biomass and channel carbon through aquatic food webs. Additionally, they are essential for the success of new reforestation and restoration projects established as part of carbon sequestration efforts, by facilitating nutrient uptake, enhancing climate change resilience, and increasing drought and salinity tolerance of plants.

GSFC actions

8.1. Promote the responsible use of native fungi as part of nature-based solutions to minimise the impact of climate change on biodiversity, ecosystems, and people.

i. Integrate native fungi into nature-based solutions for climate mitigation, adaptation, and disaster risk reduction, including in areas managed for carbon sequestration and focusing on their relationships with different groups of species.

ii. Integrate the risk of fungal disease outbreaks, and the ways climate-driven host stress affects that risk, into climate mitigation strategies.

iii. Integrate fungal contributions to carbon dynamics into national greenhouse gas inventories and climate commitments, such as Nationally Determined Contributions, as methodologies allow.

Research and infrastructure priorities

8a. Develop and validate methodologies and technology to survey and monitor fungal species and networks in situ and verify their role and impact in aboveground and belowground carbon sequestration, including fungal necromass contributions to stable soil carbon.

8b. Develop a standardised framework, with guidelines and tools that integrate experimental testing, natural ecosystem manipulations, and genomic approaches, to assess fungal species' climate vulnerability, range shifts, and adaptive capacity across different climate scenarios and compounding effects of other stressors such as pollution and habitat loss, and to identify keystone species and drivers of fungal adaptation and ecosystem recovery, prioritising the most rapidly changing habitats critical for ecosystem resistance, resilience, and carbon sequestration.

GSFC ACTIONS CONTINUED

8.2. Minimise the negative impact of climate change and ocean acidification on fungal species and communities, including through improving habitat connectivity and resilience, and, where appropriate, *ex situ* conservation.

i. Assess the impact of climate change and ocean acidification on different groups of fungi, and integrate climate vulnerability assessments and mitigation strategies into fungal species conservation and recovery plans.

ii. Develop minimisation measures to reduce the negative impacts of climate change and ocean acidification on fungal species and communities.

PRIORITIES CONTINUED

8c. Compile information on, and validate the identification of, which species and genetic traits are already available in ex situ collections that could be relevant for nature-based solutions for climate mitigation, adaptation, and disaster risk reduction and identify gaps to inform priorities for new accessions.

8d. Develop standardised guidelines, tools, and protocols, including monitoring frameworks and indicators, to integrate fungal data into climate change minimisation strategies, national carbon accounting and greenhouse gas inventories, and commitments such as Nationally Determined Contributions.

8e. Address knowledge gaps to better understand how fungal pathogens and diseases evolve and adapt to climate change, including their functional role in ecosystems and host-pathogen interactions, and identify the most effective minimisation strategies to reduce the risks to biodiversity, ecosystems, and people from fungal disease outbreaks due to climate change.

8f. Identify the abiotic conditions, biotic factors, and abiotic x biotic combinations that help promote fungal species resistance and recovery from climate change, prioritising the most rapidly changing habitats.



Photo: SPUN



Photo: Carol Shearer

02

GBF OBJECTIVE 2

Meeting people's needs through sustainable use and benefit-sharing



Targets 9 to 11 address how people use and benefit from nature. For each one, the Strategy sets out why fungi matter to meeting the target, the actions countries can take, and the research and infrastructure needed to support them.

9

GBF TARGET 9

Manage wild species sustainably to benefit people

Ensure that the management and use of wild species are sustainable, thereby providing social, economic and environmental benefits for people, especially those in vulnerable situations and those most dependent on biodiversity, including through sustainable biodiversity-based activities, products and services that enhance biodiversity, and protecting and encouraging customary sustainable use by Indigenous Peoples and local communities.

Rationale to include fungi

Many Indigenous Peoples and local communities rely on fungi as a source of food, medicine, income, and for spiritual and cultural needs. With the continuing increase in international trade of edible and medicinal species and ongoing bioprospecting efforts, it is crucial to ensure these communities can continue to benefit from wild fungi. This can be achieved by working closely with local harvesters (especially women), protecting their existing sustainable harvesting practices, and recognising and including traditional knowledge in management and decision-making through shared governance.

GSFC actions

9.1. Promote the sustainable use of wild fungal species for socio-cultural, economic, and environmental benefits to people, through traditional practices and innovative approaches, incorporating access and benefit-sharing frameworks and respecting the rights and knowledge systems of Indigenous Peoples and local communities.

i. Integrate fungi into relevant policies, legislation, and regulations to ensure the sustainable use of fungi for the benefit of people, especially Indigenous Peoples and local communities, safeguarding fair and equitable access and benefit-sharing mechanisms.

ii. Develop instruments to recognise and promote sustainable livelihoods through mushroom hunting and gathering, including the traditional practices of Indigenous Peoples and local communities, especially women.

Research and infrastructure priorities

9a. Work with Indigenous Peoples and local communities, especially women, to understand their needs and enhance their capacity to sustainably use wild fungi and address those needs, establishing fair access and use, and following ethical guidelines on conducting ethnomycological research and sharing knowledge of local wild fungi and their use.

9b. Assess access and benefit-sharing mechanisms and suggest improvements to policies, legislation, and regulations to better integrate fungi and ensure their sustainable use for the benefit of people.

9c. Develop culturally and regionally specific guidelines and tools on wild fungi harvesting, to support certification on sustainable and equitable use of fungi for commercial sale.

GSFC ACTIONS CONTINUED

iii. Support community-led development of new uses of fungi, including for bioeconomy, promoting the sustainable use of wild species while respecting access and benefit-sharing frameworks and knowledge systems and rights of Indigenous Peoples and local communities.

PRIORITIES CONTINUED

9d. Identify and continue to develop innovative applications of fungal species, which could create social, economic, and environmental benefits for people, especially in rural and underserved areas, ensuring their sustainable use and minimising risk to biodiversity.

9e. Develop market information and assess the feasibility of utilising wild fungi, co-developing strategies to encourage communities to expand their use of wild fungi for food security, additional income sources, and other benefits, through gender-responsive approaches, awareness raising, capacity-building, and behaviour change campaigns.



Photo: Koné NA

GBF TARGET 10

10 Enhance biodiversity and sustainability in agriculture, aquaculture, fisheries, and forestry

Ensure that areas under agriculture, aquaculture, fisheries and forestry are managed sustainably, in particular through the sustainable use of biodiversity, including through a substantial increase of the application of biodiversity friendly practices, such as sustainable intensification, agroecological and other innovative approaches, contributing to the resilience and long-term efficiency and productivity of these production systems, and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services.

Rationale to include fungi

While many crop and tree diseases are caused by fungi, other fungal species are critical to nature-based solutions that reduce the harm caused by agriculture, aquaculture, fisheries, and forestry to biodiversity. Mycorrhizal and other beneficial fungi underpin soil health, enhancing nutrient uptake and increasing plants' resilience to pests, diseases, and climate change, boosting plant growth while reducing the need for fertilisers and chemical pest control.

GSFC actions

10.1. Promote and sustainably integrate beneficial fungi into the design and management of agricultural, forestry, and aquaculture systems to improve their resilience and long-term efficiency and productivity, enhance food security, and conserve and restore biodiversity and ecosystem functioning.

i. Assess whether critical functional groups of fungi are present in sufficient abundance and richness in agricultural and forestry soils, and, if necessary, integrate effective management practices, including augmentation efforts, employing native inoculum or locally adapted fungal species and strains as biodiversity-positive approaches and risk-reduction strategies, monitoring their effectiveness.

Research and infrastructure priorities

10a. Continue to develop research and standardised methodologies, including accessible, low-cost tools, to identify fungal species, genotypes, and community composition in agricultural, forestry, and aquaculture systems, and to assess their function, interactions with other organisms, and contribution to ecosystem services, yield stability, nutrient quality, soil and plant health, animal digestion, resilience to climate stress, and carbon dynamics.

10b. Research the impact of fungicides and other relevant chemicals on beneficial fungal species and communities, and define safe limits for their use.

10c. Enhance research on the potential of fungal metabolites and bioactive compounds, methods to isolate them, and their applications in agriculture, forestry, and aquaculture for promoting plant growth, crop production, animal health, and disease resistance.

GSFC ACTIONS CONTINUED

ii. Implement and adapt management practices that enhance the growth of key fungal species and communities, including the use of crops and forestry tree species that are native or compatible with local conditions and that associate with native fungi and other beneficial microorganisms, taking into account climate change and species movement.

iii. Integrate fungal inoculants and other microbial products into existing regulatory frameworks for agricultural and forestry inputs, ensuring strain-specific environmental risk assessment, strain authentication, and post-release monitoring.

iv. Promote research and application of novel ways to use fungi, including fodder processing or fermentation to support animal digestion, sustainable mushroom harvesting as a secondary product of forestry management, and support of seaweed production in natural or farmed aquatic systems.

PRIORITIES CONTINUED

10d. Identify and promote locally adapted genotypes of crops and forestry tree species that can better associate with native beneficial fungi, across different ecoregions, taking projected environmental conditions into account.

10e. Develop guidelines on best practices for promoting and managing key fungal species and communities in agricultural, forestry, and aquaculture systems, providing practical, safe protocols for enhancing these communities through management or, where appropriate, through inoculation with local or native beneficial fungi, particularly in large-scale systems.

10f. Evaluate the viability of commercial inoculants and their impact on native fungal communities and biotic homogenisation.

10g. Develop tools, indicators, and protocols to monitor the success, impacts, and risks of incorporating fungi in agricultural, forestry, and aquaculture systems.



Photo: Petra + Werner Eimann Kaarst

11

GBF TARGET 11

Restore, maintain and enhance nature's contributions to people

Restore, maintain and enhance nature's contributions to people, including ecosystem functions and services, such as the regulation of air, water and climate, soil health, pollination and reduction of disease risk, as well as protection from natural hazards and disasters, through nature-based solutions and/or ecosystem-based approaches for the benefit of all people and nature.

Rationale to include fungi

Fungi are key decomposers, recyclers, biocontrol agents, and symbionts in nearly all terrestrial and aquatic ecosystems. Numerous fungi engage in relationships with other living organisms, influencing the survival and fitness of both fungus and host, and they are key components of the soil biota. It is vital to manage existing natural areas appropriately to maintain, or in some cases enhance, their fungal community and to include fungi in restoration projects to facilitate plant establishment and persistence, support detrital food webs, and maintain ecosystem services and functions.

GSFC actions

11.1. Encourage the integration of fungi into nature-based solutions and/or ecosystem-based approaches for the benefit of all people and nature, aligned with the One Health[14] approach.

i. Develop and implement nature-based solutions and/or ecosystem-based approaches that take into account fungi to restore, maintain, and enhance clean air, water, and soil health, regulate and mitigate climate impacts on humans, and promote human health and well-being.

ii. Incorporate fungi into in situ and ex situ integrated conservation actions to ensure genetically diverse fungal species and communities that provide key ecosystem services are available for use as nature-based solutions and/or ecosystem-based approaches for the benefit of all people and nature.

Research and infrastructure priorities

11a. Accelerate research on the identification and use of fungi in nature-based solutions to restore, maintain, and enhance clean air, water, and soil health, to regulate and mitigate climate impacts on humans, and to improve human health, reduce disease, and promote well-being, including in urban and other highly modified environments where fungal contributions are poorly understood.

11b. Identify fungi that negatively impact people, including emerging fungal-based diseases that might pose risks to crops and human health, and research the most effective strategies to mitigate these risks.

11c. Develop guidelines and tools on methods to integrate fungi into nature-based solutions and/or ecosystem-based approaches to restore, maintain, and enhance nature's contributions to people, as well as on standardised, long-term monitoring of these functions.

GSFC ACTIONS CONTINUED

iii. Integrate fungi into the management and restoration of inland water, coastal, marine, and transitional ecosystems, recognising their role in decomposition, nutrient cycling, and water quality, where fungal contributions remain least documented.

PRIORITIES CONTINUED

11d. Continue to research the contribution of fungi in inland water, coastal, marine, and transitional ecosystems to key ecosystem services, including decomposition, nutrient cycling, and the maintenance of water quality, and how these functions can be maintained and restored.



Photo: Mycosphaera



Photo: A. Sandor / Szeged Fungus Association

03

GBF OBJECTIVE 3

Tools and solutions for implementation and mainstreaming



Target 20 addresses the capacity, cooperation, and knowledge transfer needed to deliver the framework. The Strategy sets out why fungi matter to meeting the target, the actions countries can take, and the research and infrastructure needed to support it.

GBF TARGET 20

20 Strengthen capacity-building, technology transfer, and scientific and technical cooperation for biodiversity

Strengthen capacity-building and development, access to and transfer of technology, and promote development of and access to innovation and technical and scientific cooperation, including through South-South, North-South and triangular cooperation, to meet the needs for effective implementation, particularly in developing countries, fostering joint technology development and joint scientific research programmes for the conservation and sustainable use of biodiversity and strengthening scientific research and monitoring capacities, commensurate with the ambition of the goals and targets of the Framework.

Rationale to include fungi

Indigenous Peoples and local communities are key holders of knowledge with respect to status and management approaches of fungi in many countries across the world and are key stakeholders in the uses of wild fungi. Concurrently, the paucity of formal knowledge regarding fungal diversity, distribution, uses, and conservation status is especially challenging in many of these same countries, since it is this knowledge that is most used to address the GBF goals and targets. Consequently, both the erosion and loss of Indigenous and local knowledge and the lack of access to necessary technologies and research support present major threats to the conservation and sustainable use of wild fungi. Therefore, capacity-building for joint scientific research programmes, access to and transfer of various technologies, and the protection and use of Indigenous and local knowledge through South-South, North-South, and triangular cooperation must all be central to efforts towards knowledge documentation, creation, and transfer to meet the goals and targets of the GBF.

GSFC actions

20.1. Develop national and regional capacity-building and skill-development training on fungi, their conservation, and their sustainable and equitable use.

i. Strengthen the capacity of decision-makers and practitioners to include fungi in conservation initiatives across all targets, including through access to the tools, evidence, and expertise needed for informed decisions.

ii. Integrate fungi into national curricula, prioritise training of mycologists in areas with limited expertise, and support the establishment of dedicated mycological

Research and infrastructure priorities

20a. Identify, globally and locally, the main training needs and skill gaps in fungal conservation, taxonomy and systematics, integrative approaches, ecology, collection and database management, and social sciences, together with the knowledge gaps that prevent decision-makers and practitioners from including fungi in conservation initiatives and the gendered barriers to participation in fungal science and training.

20b. Develop the research base and educational infrastructure, including age-, skill-, language-, and context-appropriate training and class materials on fungal diversity, biology, ecology, and conservation, to support the integration of

GSFC ACTIONS CONTINUED

positions and institutional units to provide sustained professional infrastructure.

iii. Strengthen and connect existing networks of fungal experts, amateur mycologists, and enthusiasts, especially students and youth, recognising mycological societies and community science initiatives as key drivers of capacity-building, data generation, and public engagement, and facilitating access to scientific services and resources.

iv. Promote more fungal conservation sessions at national and international mycological, ecological, and conservation conferences.

20.2. Support technological innovation and knowledge transfer between South-South, North-South, and other partners to foster growth and development for fungal conservation, and establish frameworks for the sustainable use of fungal bioresources and for access and benefit-sharing to strengthen research cooperation while respecting the knowledge systems and rights of Indigenous Peoples and local communities.

i. Integrate fungi into initiatives of lead national agencies or institutions responsible for fostering technological innovation and joint scientific cooperation, to transfer knowledge on using, protecting, and conserving fungi.

ii. Develop policies and frameworks that mobilise and leverage resources, and enhance political support to strengthen technological innovation, knowledge transfer, and joint scientific cooperation to use, protect, and conserve fungi, including on sustainable use, access and benefit-sharing between country/institution partners.

iii. Promote the development of research tools and knowledge resources to support fungal conservation practice and policy.

PRIORITIES CONTINUED

mycology into national curricula and to build the capacity of amateur mycologists and fungal enthusiasts in different aspects of fungal conservation.

20c. Develop a database of universities/institutions and of individual mycologists that provide training on fungi and their field of expertise per country.

20d. Increase communication, cooperation, and knowledge transfer between mycologists and lead national agencies, institutions, and businesses responsible for fostering technological innovation and joint scientific cooperation.

20e. Review policies, regulatory frameworks, and guidelines to identify successful cases that integrate fungi and propose pathways to include sustainable use of fungi and access and benefit-sharing mechanisms in those that do not.

20f. Create and maintain a fungal conservation open-access portal that includes a database of conservation efforts focused on fungi, and integrates different interoperable databases and resources to facilitate access, collaboration, and knowledge transfer among regions.



Photo: Christian Laudereau/Mycological Society of New-Caledonia

Abbreviations

CBD Convention on Biological Diversity

CITES Convention on International Trade in Endangered Species of Wild Fauna and Flora

COP Conference of the Parties

eDNA environmental DNA

GBF Kunming-Montreal Global Biodiversity Framework

GFCN Global Fungal Conservation Network

GSFC Global Strategy for Fungal Conservation

GSPC Global Strategy for Plant Conservation

IUCN International Union for Conservation of Nature

KBA Key Biodiversity Area

NBSAP National Biodiversity Strategy and Action Plan

OECM Other Effective Area-based Conservation Measure

OTU Operational Taxonomic Unit

UNCCD United Nations Convention to Combat Desertification

Glossary

Biobanking: The systematic storage of biological material, such as fungal cultures, spores, or tissue, for long-term conservation and research use, including through cryopreservation at very low temperatures.

Cryptic diversity: Distinct species that cannot be reliably separated by appearance alone and are usually detected using molecular methods.

Darkspots: Areas, ecosystems, or taxonomic groups that remain poorly sampled and for which data are lacking.

Ethnomycology: The study of the relationships between people and fungi, including their cultural, spiritual, and practical uses.

Functional group: A set of species grouped by the ecological role they perform rather than by their evolutionary relationships.

Funga: The fungi of a particular region or habitat, the equivalent of flora for plants and fauna for animals.

Fungarium: A curated collection of preserved fungal specimens, held as a permanent scientific reference.

Inoculum and inoculant: Fungal material used to introduce or increase fungi in a soil, substrate, or host plant, and the product in which it is supplied.

Living culture: A living fungal strain maintained in cultivation by an institution for research, conservation, or reintroduction.

Microfungi: Fungi whose structures are only visible under magnification.

Mycelium: The network of fine filaments (hyphae) that forms the main body of a fungus.

Mycorrhizal fungi: Fungi that form mutually beneficial associations with plant roots, exchanging nutrients and water for carbon. The main types are arbuscular mycorrhizal fungi, which colonise the roots of most plant species including many crops; ectomycorrhizal fungi, associated particularly with trees and shrubs; ericoid mycorrhizal fungi, associated with heathland and related plants; and orchid mycorrhizal fungi, on which orchids depend for germination and, in some species, throughout their lives.

Mycotourism: Tourism centred on fungi, including guided forays, festivals, and associated hospitality.

Mycovirus: A virus that infects fungi, of interest as a potential means of controlling invasive or pathogenic species.

Necromass: Dead organic material, including dead fungal tissue, which contributes to stable soil carbon.

Operational Taxonomic Unit (OTU): A group of sequences clustered by similarity and used as a working proxy for a species where no formal name is available.

Saprotrophic fungi: Fungi that obtain nutrients by decomposing dead organic matter.

Strain: A genetically distinct isolate within a fungal species, which may differ from others in traits such as local adaptation, growth, or the compounds it produces.

Symbiont and mutualist: An organism living in close association with another, in a mutualism to the benefit of both.

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The community behind the Strategy

Global Fungal Conservation Network

The Fungal Conservation Network was established in 2024 as an informal collaboration of experts from various organisations across all seven continents. The primary aim of this network was to advise on and contribute to the development of the GSFC, and a broad range of members were involved from universities, research institutions, botanic gardens, and non-governmental organisations. As the Strategy developed, additional experts contributed to specific targets, bringing the total before public consultation to 73 people from 45 organisations representing 30 countries.

This group is now recognised as the Global Fungal Conservation Network (GFCN), an independent network of experts dedicated to supporting the implementation of the Strategy. The GFCN serves as the coordinating body for implementation, providing guidance, tracking progress, and supporting countries and organisations in translating the Strategy's actions into practice.

We welcome new members from across sectors, including mycologists, ecologists, conservation biologists, policymakers, social scientists, and local stakeholders, to join the network and help deliver its actions and research and infrastructure priorities. To find out more and apply, visit globalfungalconservation.org/join, where you can also read the network's Terms of Reference.

Secretariat

Plantlife International - the global voice for wild plants and fungi - is currently serving as the Secretariat to the GSFC, working closely with the GFCN. They provide administrative and operational support, assisting with communications, advocacy, and integration of the Strategy with national, regional, and international frameworks, policies, and strategies.

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Photo: Stephen Axford

ANNEX

Case studies, tools, and resources



This annex brings together examples of fungal conservation in practice, alongside tools and resources that can support delivery of the actions recommended in this Strategy. Each is indexed against the GBF targets they contribute to, so that readers working on a particular target can easily find relevant experiences and existing resources.

The selection of case studies reflects the range of approaches and contexts in which fungi are being conserved rather than attempting full coverage, and it is maintained and expanded at globalfungalconservation.org, where new contributions can be submitted.

Fungi in legislation

TARGETS 1 3 4 5



Gerronema viridilucens, one of the 24 species on Brazil's first official list of threatened fungi. Photo: A.H.R. Domingos/IPBio

A growing number of countries and subnational jurisdictions are formally integrating fungi into their biodiversity legislation. Poland was the first country to explicitly recognise fungi alongside plants and animals in nature conservation law, with hundreds of fungal species now under strict or partial legal protection under the Nature Conservation Act. Chile followed a similar approach, including fungi explicitly in Law 19.300 on General Environmental Principles through its amendment via Law 20.417 (2010, enacted 2013), ensuring that fungi are considered in biodiversity protection, environmental impact assessments, and conservation planning.

In 2026, Brazil published its first official national list of threatened fungi (Portaria GM/MMA No. 1.696). The list covers 24 species, 21 Vulnerable and three Endangered, and bans collecting, transporting, and selling them except for authorised scientific or conservation work.

Geographic scope
Poland, Chile, Brazil, Austria

Type
Policy and law

Relevant to
Governments

At the subnational level, Vienna is currently working to formally include funga alongside flora and fauna in Vienna's Nature Conservation Law, marking an important step at the municipal level. These examples illustrate how legislative inclusion of fungi is a critical and achievable step towards ensuring that fungi receive the legal recognition and protection needed to implement this Strategy.

Aquatic fungi

TARGETS 1 2 3 4



Stream sampled for FUNACTION, Mata de Albergaria, Peneda-Gerês National Park, Portugal. Photo: Isabel Fernandes

Two complementary Biodiversa+ EU Biodiversity Partnership funded projects are advancing the understanding and conservation of aquatic fungi across Europe. The *Monitoring Strategies and tools to address knowledge gaps on aquatic Fungal biodiversity* (MoSTFun) project aims to fill critical knowledge gaps on aquatic fungi and integrate them into biodiversity monitoring programmes, including the potential to find invasive aquatic fungal species with conservation relevance, such as *Batrachochytrium dendrobatidis*. By developing shared protocols, open data infrastructures, and analytical tools, MoSTFun enables systematic monitoring of aquatic fungal communities, standardised documentation of species occurrences, and rapid synthesis of biodiversity data. These tools support the assessment of species' extinction risk under global criteria, help identify priority taxa and regions for conservation, and allow tracking of recovery trends over time.

Geographic scope
Europe

Type
Knowledge and data

Relevant to
Governments, Researchers

Complementing this, the project *Aquatic fungal biodiversity: Developing knowledge and strategies to inform conservation priorities and measures* (FUNACTION) is identifying continental patterns in aquatic fungal biodiversity, testing the effectiveness of currently established protected areas across Europe in conserving aquatic fungi, and developing standardised protocols for molecular-based biodiversity surveys. All data from this project will feed into systematic conservation planning using aquatic fungi.

Grasslands and rangelands: fungi, grazing, and livelihoods

TARGETS 2 4 10 11



Sampling soil for mycorrhizal fungi in Mongolia. Photo: Tomás Munita

Geographic scope
Mongolia, United Kingdom

Type
Practice

Relevant to
Farmers, Land managers, Governments

Grasslands and rangelands cover more than half of the world's land and produce around one sixth of the world's food. Two billion people depend on them, including an estimated half a billion pastoralists, and they hold nearly a third of the planet's carbon reservoir. Yet up to half of the world's rangelands are now degraded. Fungi are central to how these landscapes cope with stress and recover. Grasslands hold around 40% of the world's predicted arbuscular mycorrhizal hyphal biomass, which helps plants take up water and nutrients and hold soil together, so the condition of these fungal networks affects how well rangelands resist drought and recover.

In Mongolia, researchers found that nearly 90% of the mycorrhizal fungal DNA sequenced from the Gobi desert steppe belonged to species unknown to science, and that degradation has reduced fungal diversity by up to 70% in some areas. They are now using fenced plots to test whether grasslands and their fungi recover when grazing pressure is reduced. Grazing is not always harmful, though. In north-west Europe, waxcaps and other grassland fungi depend on old, nutrient-poor pastures kept short by grazing or mowing. Because the effects of grazing on fungi vary with climate, soils, and grazing intensity, management needs to match local conditions. Bringing fungi into rangeland management and restoration would benefit both pastoralists and the soils their livelihoods depend on.

Spatial planning and protected areas

TARGETS 1 3



Pink Waxcap, *Porpolomopsis calyptriformis*. Photo: Ray Woods / Plantlife

Geographic scope
Gabon, Poland, United Kingdom

Type
Practice

Relevant to
Conservation organisations, Governments, Land managers

A number of different efforts have been ongoing to include fungi in the identification of important and protected areas for biodiversity. For example, Gabon fully integrated fungi in their recent KBA identification process, which will also be considered in their National Land Allocation Plan. In the UK, Plantlife has identified 520 Important Fungus Areas (IFAs), highlighting sites of mycological interest based on the presence of significant populations of rare fungal species, exceptionally rich funga, and outstanding habitat examples. Although these currently need to be updated, they provide an initial baseline for spatial planning and management at the national level.

Also in the UK, the government has published dedicated guidelines for the selection of fungal protected sites, and England, Wales, and Scotland have designated several sites specifically for their fungi, including The Leasowes in Halesowen, due to its waxcap grasslands. Notably, the designation of The Leasowes was supported by evidence from fungal environmental DNA (eDNA) surveys, one of the first uses of this technique to secure statutory protection for a site. In Poland, the Osetno Nature Reserve was designated in 2008 with the main goal of protecting its exceptional diversity of macrofungi. Across Europe, there are also ongoing efforts to integrate aquatic fungi into conservation and spatial planning, assessing the effectiveness of existing protected areas and optimising plans to include their protection.

Managing land for fungi under uncertainty

TARGETS 1 3 4

Geographic scope
Netherlands, United States

Type
Practice

Relevant to
Governments, Land managers

Adaptive management approaches allow land managers to protect fungi even where species distribution, habitat requirements, and ecology remain poorly known, gathering evidence as they go without having to wait for complete data. In the United States, the Survey and Manage Program of the Northwest Forest Plan is an illustrative example of how land managers can make decisions regarding fungal conservation under high levels of scientific uncertainty. This program was established in 1994 to conserve old-growth forest-associated fungi and other species. Fungal conservation was integrated within the larger regional ecosystem management plan, using an adaptive management approach, and leveraging partnerships between researchers and land management agencies. Known sites were protected while surveys gathered information on poorly known species, supported by dedicated identification handbooks for the 234 listed fungal species, and a later amendment introduced an annual species review to reassess species' needs as knowledge improved.

Another example comes from the Netherlands, where managers were interested in including fungi, but knowledge of fungal habitat requirements and, consequently, best 'fungus-friendly' management approaches were scattered and difficult to access. To address these gaps, a group of Dutch mycologists published 'Macrofungi in conservation management', providing national guidance on the ecology of fungal functional groups, the habitats and main threats to fungal diversity, and the management opportunities for their sustainable conservation and restoration, including alignment with the European Union's Habitats Directive, so that managers could act on what is already known.

Community science

TARGETS 1 3 4 20



Community science event organised by the Szeged Fungus Association. Photo: A. Sandor / Szeged Fungus Association

Geographic scope
Global

Type
Knowledge and data, People and capacity

Relevant to
Communities, Conservation organisations, Researchers

Community science initiatives are pivotal for fungal conservation as they rapidly expand the quantity, geographic coverage, and temporal depth of fungal occurrence data. Initiatives such as FunDive, FUNDIS, Mushroom Observer, Fungi Map, and iNaturalist mobilise trained volunteers and amateur mycologists to document species distributions, phenology, habitat associations, and population trends. In British Columbia, MycoMap received nearly 14,000 fungal collections from over 100 community participants across the region within its first months, yielding 95 species new to the province and 11 potential new-to-science barcodes. This initiative demonstrates how community science combined with DNA barcoding can be rapidly scaled. Its decentralised, open model is being actively studied as a blueprint for replication in other data-poor regions.

In Hungary, the Citizens for Fungi Diversity project, run by the Szeged Fungus Association, increased Hungarian fungal observations on iNaturalist from fewer than 3,000 in 2021 to more than 30,000 in 2024. The association also offers an open library, photo and sampling guides, workshops, and DNA barcoding. In North America, the North American Mycological Association's Voucher Collection Project has collected reference specimens at its forays since 1997, and several thousand are now held at the Field Museum herbarium so that researchers can check the records.

These observations and georeferenced records feed directly into extinction risk assessments such as IUCN Red List assessments, and they help identify hotspots of endemism or decline, and reveal emerging threats.

Mainstreaming fungi into national biodiversity policy: Mexico

TARGETS 1 3 20



Training local technicians and community members in soil sampling, Mexico City, Mexico. Photo: Bernardo Águila

Geographic scope
Mexico

Type
Policy and law, Knowledge and data

Relevant to
Governments, Researchers

Mexico, one of the world's most megabiodiverse countries with an estimated 200,000 fungal species, is a recent example of the systematic integration of fungi into national biodiversity policy and research infrastructure. Researchers at the National Autonomous University of Mexico (UNAM) have developed the Atlas de la Biodiversidad del Suelo de México, an interdisciplinary initiative that uses large-scale DNA sequencing to characterise soil biodiversity, including fungi, across Mexican territory. These data are openly accessible through geographic and taxonomic visualisations and provides decision-relevant information to government and society on soil health, ecosystem functioning, and the impacts of land-use change.

The project has established active collaborations across academia, government, and civil society, and includes dedicated educational resources and community outreach, building public awareness of the invisible but essential role of soil fungi in maintaining ecosystem integrity and food security. These efforts showcase how research institutions can translate research into policy and serve as catalysts for mainstreaming fungi into national biodiversity strategies, especially in megabiodiverse countries where fungal data remain underutilised in conservation decision-making.

Integrating fungi into a national environmental monitoring baseline

TARGETS 1 7 8 10



Ectomycorrhiza of *Lactarius chrysorrheus* in association with an oak root. Photo: D. Satori, RBG Kew

Geographic scope
United Kingdom

Type
Knowledge and data

Relevant to
Governments, Land managers, Researchers

Mycorrhizal fungi are being included by the UK Government's Department for Environment, Food and Rural Affairs (Defra) in assessments of soil condition and function across all English habitats. For the first time, mycorrhizal fungi are being surveyed across England through the UK Government-funded Natural Capital and Ecosystem Assessment (NCEA) programme, which will establish a baseline of England's natural capital assets by 2029.

As part of the programme, the Mycorrhizal Ecology Team at the Royal Botanic Gardens, Kew is building baseline datasets of England's mycorrhizas, covering both the fungi and the plants involved in the symbiosis. Roots are processed in Kew's laboratories from soil samples collected in large-scale field surveys by Forest Research and Natural England, which are also NCEA partners. The team measures mycorrhizal diversity, abundance, composition, and interactions with plants. These data can be combined with soil variables produced by other partners to fill research gaps on the diversity, distribution, and contributions of England's mycorrhizas to ecosystem health and function.

The programme was designed to address UK Government evidence gaps, so mycorrhizal data feed directly into environmental planning and policy. The baseline dataset is informing a national soil health indicator, helping to meet statutory reporting requirements on the environmental impacts of air pollution, and improving understanding of how mycorrhizas contribute to soil carbon. As more years of data are added, there will be scope for further analysis and use in policy.

Species recovery, reintroductions, and translocations

TARGETS 2 4

Geographic scope
Australia, Finland, Sweden, United Kingdom

Type
Practice

Relevant to
Conservation organisations, Governments, Land managers

Fungal reintroductions, translocations, and species recovery programmes are beginning to demonstrate that active conservation interventions are both feasible and effective for fungi. In the UK, England has set an ambitious target to halt species decline and reduce extinction risk by 2042, a policy that applies to all taxa, including fungi. Natural England's Species Recovery Programme is explicitly funding conservation projects for threatened fungi, identifying their recovery needs from national monitoring, diagnosis of decline, solution testing, and deployment, covering different areas from taxonomy, autecology research, site management, conservation translocations, and policy change. This has supported Plantlife's work to reintroduce the endangered scrambled egg lichen (*Gyalolechia fulgens*) from Penhale in Cornwall to its historic Breckland habitat in East Anglia, from which it had been extirpated since 1984 due to habitat loss. Two hundred small patches were carefully removed and 160 transplanted into the Breckland chalky landscape using water and bookbinding glue, with demonstrated success over a relatively short timeframe.

Also in the UK, an important population of grassland fungi identified during the development of the West Suffolk Hospital was translocated as part of the mitigation measures. The turves of grassland were stripped and moved onto an appropriate compensation site. Follow-up monitoring indicates that the grassland fungi survived the translocation, but will be monitored over the next 10 years to fully understand how resilient these fungi are to translocation. At a broader scale, the Natural Resources Institute Finland has developed what is to date the largest standardised fungal reintroduction program, growing bulk spawn of seven red-listed wood-inhabiting species and inoculating over 1,700 log pieces across 53 plots in Finland and Sweden.

This project found that strain selection, inoculation method, and a brief period of pre-translocation colonisation in controlled conditions are critical determinants of establishment success.

Monitoring rare fungi, and measuring the outcomes of recovery work, is often limited by how difficult they are to detect. Many species fruit only briefly and irregularly and spend most of their life cycle hidden in soil or wood, so the absence of records does not necessarily mean the absence of a species. New survey approaches are helping to address this. In Australia, wildlife detection dogs trained to find the Critically Endangered tea-tree fingers (*Hypocreopsis amplectens*) located more individuals faster than human surveyors in the first application of detection dogs to fungal conservation. Similarly, the UK utilities company Severn Trent Water has trained detection dogs to survey for waxcaps along new pipeline routes. Great Britain has an international responsibility for its waxcap grasslands, but outside the fruiting season these fungi are difficult to locate, and the grasslands may appear of little botanical interest, so they can be overlooked in standard ecological surveys. Initial results from this approach have been encouraging.

Ecological restoration

TARGETS 2 4 10 11



Bracket fungus fruiting from a heart-rot inoculation site in a living tree. Photo: Matthew Wainhouse

A number of emerging fungal restoration initiatives are integrating native fungi and explicitly monitoring fungal community recovery alongside plant establishment and ecosystem function. One novel application addresses the global loss of old trees, which is reducing the availability of tree hollows critical for cavity-nesting birds and other wildlife. Since hollows form through long-term fungal decay, particularly by heart-rot fungi, restoration trials in the UK are inoculating heart-rot fungi into living trees to accelerate cavity formation. Early results suggest this could provide a viable approach to restoring critical habitats and supporting forest biodiversity. In Finland, prescribed burning increased the abundance and richness of red-listed polypores 16 years after treatment, while felling to create dead wood had no detectable effect. In Britain, the Mycorrhizas of the British Rainforest project is mapping mycorrhizal fungi and testing soil transfers and inoculation as restoration methods. At Glandwr Forest in Wales, trees inoculated with soil from mature woodland grew faster in their first year.

Geographic scope
Finland, United Kingdom, United States

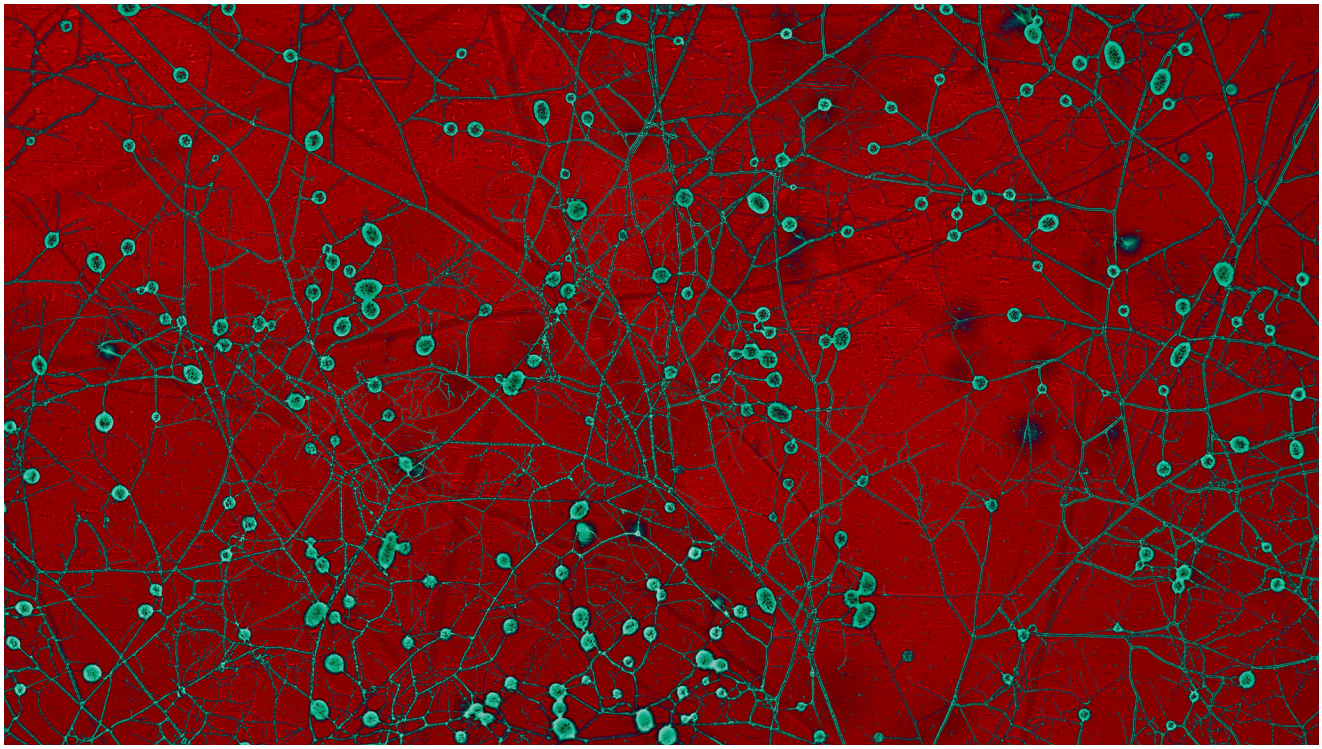
Type
Practice

Relevant to
Businesses, Land managers, Researchers

This field is also attracting private investment and carbon finance. Funga, a company in the US, reintroduces native fungal communities to forest soils, and MycoBloom cultivates native arbuscular mycorrhizal fungi for restoration and low-input farming. In the UK, RBG Kew is working with the Woodland Carbon Code, the national standard for woodland carbon projects, to explore whether mycorrhizal data could be used as an indicator of successful woodland creation.

Fungal inoculation

TARGETS 2 6 8 10



Spores and hyphae of mycorrhizal fungi under the microscope (colour added), AMOLF, Netherlands. Photo: Tomas Munita

The rapid expansion of fungal inoculation in ecosystem restoration and agriculture urgently needs coherent legal frameworks on risk assessment. For example, at the moment, mycorrhizal fungi marketed as biostimulants under the EU Fertilising Products Regulation (EU) 2019/1009 are primarily assessed only for safety to human health, with limited scrutiny of potential environmental risks. By contrast, fungi used as biocontrol agents under the Regulation (EC) No 1107/2009 (Plant Protection Products Regulation) are subject to strain-specific environmental risk assessment, including impacts on non-target organisms and ecosystems.

As industrial-scale fungal applications expand in restoration, climate mitigation initiatives, agriculture, and biomaterials, a precautionary and proportionate risk assessment framework, modelled on the Plant Protection Products regime, should be considered to evaluate ecological impacts, genetic spillover, persistence, and unintended effects on native fungal communities before large-scale release.

Geographic scope
European Union

Type
Policy and law

Relevant to
Businesses, Farmers, Governments

Ex situ conservation

TARGETS 4



Cultures of threatened fungi, CFAB MIND.Funga, Federal University of Santa Catarina, Brazil. Photo: Elisa Werlang

The *Brazilian Threatened Fungal Species Collection* (*Coleção de Fungos Ameaçados do Brasil – CFAB MIND.Funga*), maintained by the Mycology Laboratory at the Federal University of Santa Catarina (UFSC), is the first *ex situ* culture collection exclusively dedicated to the conservation of threatened fungal species in a megadiverse country. The collection aims to integrate curated specimens, taxonomic knowledge, and associated ecological and distributional data to support extinction risk assessments, conservation planning, and future recovery actions. This group also conducts strategic field expeditions to locate and isolate threatened Brazilian fungal species into pure culture, develops culture maintenance protocols designed to be transferable to other institutions, and plans to distribute clones to reference collections across Brazil to safeguard genetic diversity. CFAB MIND.Funga demonstrates how dedicated collections can serve as foundational infrastructure for species recovery and provide an approach that other institutions could adopt.

Geographic scope
Brazil, Russia

Type
Knowledge and data, Practice

Relevant to
Conservation organisations, Researchers

Long-term maintenance is also essential. In Russia, the Komarov Botanical Institute Basidiomycetes Culture Collection has been maintained since the late 1950s and includes regionally and nationally protected species. Each strain is kept in parallel by subculture, storage under water, and cryopreservation, as no single method works for all species.

Extinction risk assessments

TARGETS 4



Jackson's slender amanita (*Amanita jacksonii*), Vermont, United States. Photo: Samuel Howell/Getty Images via Canva

Automated extinction risk prediction and rapid assessment tools offer a promising avenue for addressing the severe underrepresentation of fungi on the IUCN Red List. A workflow was recently developed using publicly available occurrence records to model predicted extinction risk based on record count, proportion of contemporary records, and year of species description, achieving accuracy comparable to models applied to better-known groups. The workflow identified over 700 North American fungi confidently predicted to be Least Concern, for which assessments are being automatically generated and will be submitted to the IUCN Red List. Developing and scaling similar tools across other fungal groups and regions, including approaches capable of detecting population declines and data-deficient species, will be critical to achieving comprehensive coverage of fungi in global conservation assessments and indicators.

Geographic scope
North America

Type
Knowledge and data

Relevant to
Conservation organisations, Researchers

Sustainable use and species recovery

TARGETS 4 5 9

Developing sustainable use frameworks, cultivation alternatives, and certification schemes is essential to reduce overexploitation pressure on wild fungal species while maintaining the livelihoods of communities that depend on them. In Chile, the Fungi Foundation worked with local communities and harvesters in the Los Ríos Region to develop the first sustainable harvest plan for *Butyriboletus loyo* (Loyo), an Endangered edible mushroom of deep cultural importance to the Mapuche people. This work culminated in a "Manual for the harvest and sustainable management of wild edible mushrooms" (2021), with key recommendations including harvesting only mature specimens and cutting the stipe base rather than uprooting the mycelium. Complementary efforts are also underway to extend the distribution of loyo into additional patches of suitable *Nothofagus* forest, alongside ongoing studies to develop low-impact harvesting methods. In East Africa, the International Crane Foundation and the Endangered Wildlife Trust introduced mushroom cultivation as an alternative livelihood for communities around crane-inhabited wetlands in Uganda and Rwanda. Participants report reduced dependence on wetland resources, demonstrating how fungi-based enterprises can generate direct conservation co-benefits for other species and habitats.

At a broader scale, the FairWild Standard offers the only certification framework designed specifically for the sustainable and equitable wild collection of plants, fungi, and lichens, covering ecological sustainability, fair trade, and social criteria. In contrast, commercially harvested lichens in India demonstrate the consequences of the absence of such frameworks: large-scale, largely unregulated harvesting for use in traditional medicine, food, and perfumery has driven formerly widespread species such as Parmotrema chinense to rarity, with bulk trade continuing largely unchecked through online platforms.

Geographic scope
Chile, India, Rwanda, Uganda

Type
Markets and business, Practice

Relevant to
Businesses, Communities, Governments

Without species-specific harvest plans, community-led cultivation enterprises, and robust certification frameworks, overexploitation can push both fungal species and the communities that depend on them past the point of recovery. International trade regulation is also beginning to include fungi. CITES Parties agreed in 2002 that the Convention applies to fungi, but no fungal species has yet been listed. Following proposals from the United Kingdom, Parties at CoP20 in 2025 adopted decisions asking the CITES scientific committees to advise on how to put this into practice.

Fungi, livelihoods, and gender

TARGETS 5 9



Women and children with harvested straw mushrooms (*Volvariella volvacea*), West Africa. Photo: Nourou Yorou

Geographic scope
Benin, Zambia

Type
Markets and business

Relevant to
Communities, Conservation organisations

Across sub-Saharan Africa, wild edible fungi are a critical source of food, nutrition, and income for rural communities. In most African regions, mushrooms are predominantly harvested and sold by women and their children, and represent an important source of family income for marginalised communities during the harvest season. For example, in Benin, more than 70 edible species have been identified, with annual production in natural forests reaching around 300 kg/ha. Recognising that cultural and legislative barriers often restrict women's access to land, the Fungal Conservation in Sub-Saharan Africa project in Benin is training 90 women from 10 villages in mushroom cultivation as a low-resource, space-efficient alternative livelihood that simultaneously reduces pressure on forest ecosystems.

In Zambia, the Tuswayane Women's Club started growing mushrooms as, due to the changing climate, they could no longer depend solely on growing vegetables and raising chickens. Today, they supply mushrooms to a major commercial food chain, with profits reinvested into goats, seeds, and savings schemes that benefit the whole community. Wild and cultivated fungi harvesting is not just peripheral to rural economies, but foundational to women's economic agency and food security across the Global South. Their recognition, protection, and sustainable management must be central to both biodiversity and development policies.

Large-scale sequencing of fungal historical collections

TARGETS 4 20



Fungarium at the Royal Botanic Gardens, Kew. Photo: RBG Kew

Geographic scope
United Kingdom

Type
Knowledge and data

Relevant to
Researchers, Botanic gardens and museums

The UK's Royal Botanic Gardens, Kew houses one of the world's largest fungaria, containing over 1 million preserved fungal specimens from across the globe. Launched in 2024, the Fungarium Sequencing Project (FSP) is sequencing DNA from historical fungal and lichen collections held at Kew, the Royal Botanic Garden Edinburgh, and the Natural History Museum, London.

Supported by the UK Government and the Calleva Foundation, the FSP aims to sequence 7,000 type specimens (the preserved specimens that serve as the permanent name-bearing reference for each species). The project will establish next-generation *-omics* methodologies to unlock the genetic information in these collections, and develop procedures to support large-scale fungarium sequencing, including robust Access and Benefit Sharing frameworks for globally sourced collections. The resulting data will provide a fundamental baseline for fungal taxonomy and facilitate the rapid identification of environmental fungi, serving as an essential genetic reference to inform future extinction risk assessments, conservation planning, and management strategies.

Sequencing historical collections will also give new insights into how fungal diversity has changed through time and how species respond to environmental pressures, helping to identify solutions for food security under a changing climate. All genomic data will be made openly available through the European Nucleotide Archive, creating a lasting global resource for research, conservation, and policy.

Invasive species

TARGETS 6

Invasive fungi, both pathogenic and non-pathogenic, represent a growing and underappreciated threat to native biodiversity. The Death Cap (*Amanita phalloides*), a species responsible for the majority of fatal mushroom poisonings globally and native to Europe, has spread across the world over the past century, reaching Australia and the Americas. The Fly Agaric (*Amanita muscaria*), introduced via commercial forestry, has switched hosts from pine plantations to native *Nothofagus* forests across the Southern Hemisphere, with the potential to displace native ectomycorrhizal fungi. Most recently, the Golden Oyster mushroom (*Pleurotus citrinopileatus*), a wood-decay fungus native to eastern Asia and widely sold in cultivation kits, escaped into North American forests around 2010 and is now rapidly expanding its range. Metabarcoding surveys found that colonised trees host significantly fewer fungal species than uncolonised ones, making it the first documented case of a cultivated edible fungus spreading and reducing native fungal biodiversity.

Encouragingly, some commercial growers are already responding voluntarily by stopping cultivation of golden oysters. In the UK, the mushroom cultivation community has collectively taken action to stop growing and selling golden oyster products. Elsewhere, a small but growing number of companies are taking similar action, such as North Spore in the US, which discontinued outdoor golden oyster products, and Growers of Mushroom/Funghi Romani in Italy, which ceased all sales and launched a community science observatory to track the species' spread.

Geographic scope
Global

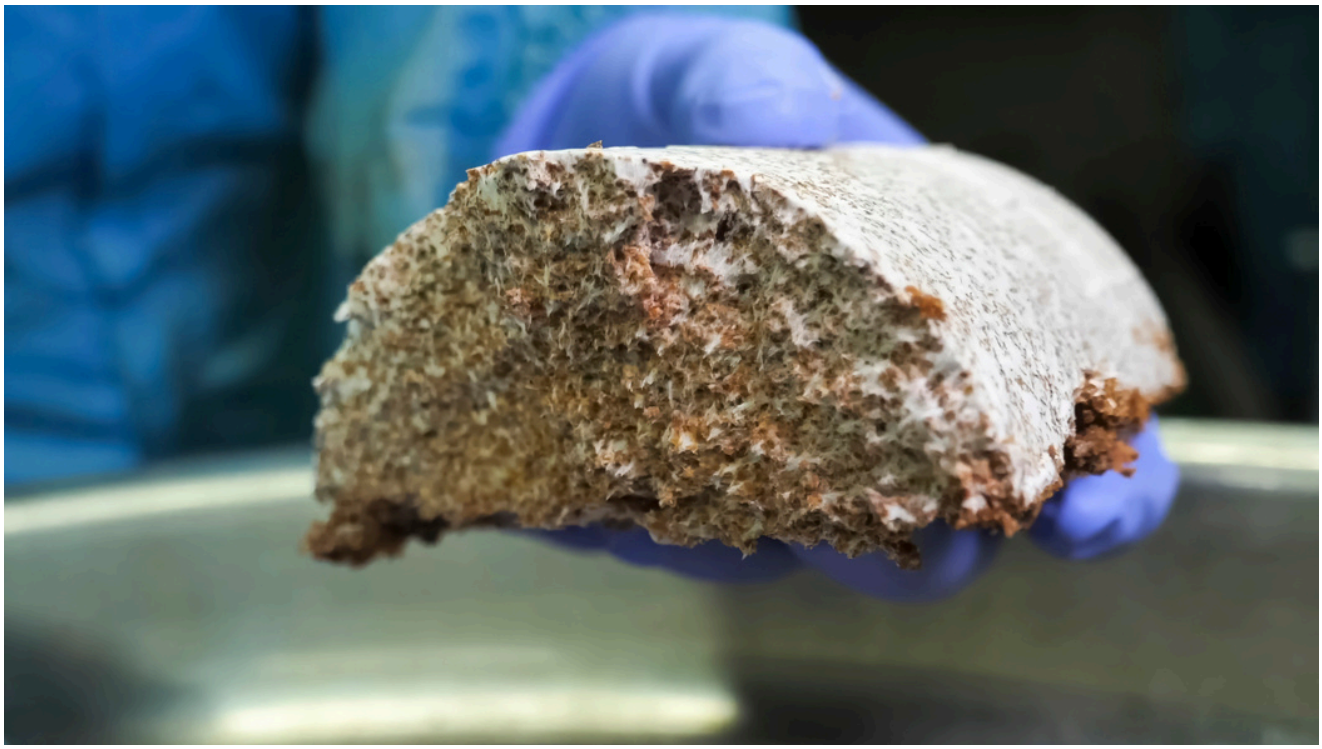
Type
Policy and law, Practice

Relevant to
Businesses, Governments

In terms of pathogenic fungi, the chytrid fungus Batrachochytrium dendrobatidis, spread anthropogenically through the global amphibian trade, has driven the decline of hundreds of amphibian species, and 90 have gone extinct or are presumed extinct in the wild. Integrating invasive fungi into national biosecurity frameworks, regulating introduction pathways, particularly through live plant, soil, cultivation kit trade, and non-local fungal inoculants, and investing in early detection tools and evidence-based management strategies are urgently needed.

Alternatives to petroleum-based plastics and synthetic materials

TARGETS 7 9 11



Plant material bound by fungal mycelium. Photo: Olga Kostrova/Canva

Fungal mycelium is emerging as one of the most versatile and promising biological alternatives to petroleum-based plastics and synthetic materials, offering scalable, low-impact alternatives to some of the most polluting materials in modern supply chains. Mycelium-composite materials use fungi's natural capacity to bind organic particles together, producing biodegradable materials with valuable properties using cheap agricultural by-products as substrate. For example, Ecovative Design, founded in the US in 2007, pioneered the commercial development of mycelium composites, now used by major brands including IKEA and Dell as a home-compostable replacement for polystyrene packaging.

Beyond packaging, mycelium-based materials are being developed across a rapidly expanding range of applications, including biodegradable flooring and acoustic tiles by Mogu, mycelium leather by MycoWorks and by Indonesia-based MYCL for footwear and accessories, as well as biodegradable coffins by Dutch startup Loop. In Kenya, the emerging company MycoTile is producing fungi-based construction panels by combining mycelium with agricultural waste from sugar factories to create insulation and wall panels. Researchers at EMPA (Switzerland) are also developing a living material from fungal mycelium and its own extracellular matrix that is fully biodegradable, tear-resistant, and produced without chemical processing steps.

Geographic scope
Global

Type
Markets and business

Relevant to
Businesses

Farming for fungi: management practices that support beneficial soil fungi

TARGETS 10

Geographic scope
Global

Type
Practice

Relevant to
Farmers, Governments, Land managers

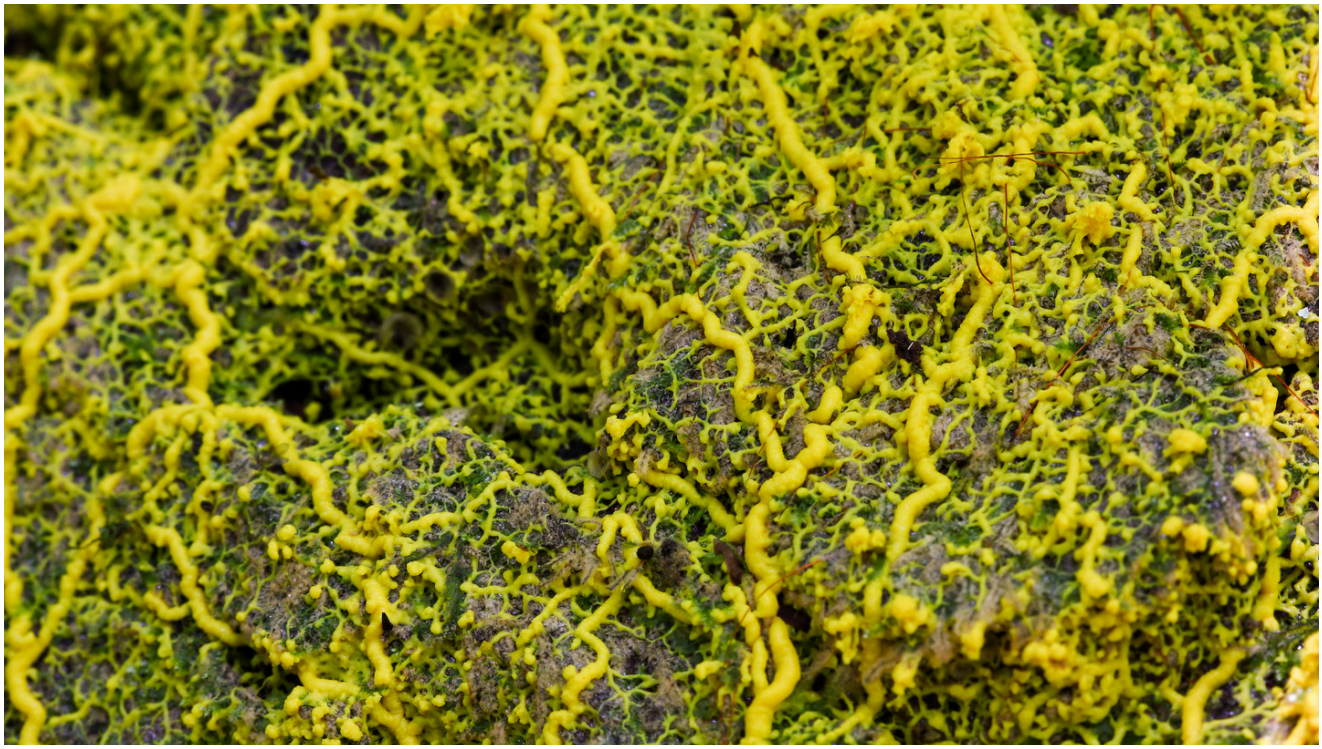
Beneficial soil fungi, particularly mycorrhizal fungi, are among the most functionally important yet most vulnerable components of agricultural and forestry systems. A growing body of evidence demonstrates that common farming practices directly determine whether these communities thrive or decline, with significant consequences for crop productivity and ecosystem resilience. A global meta-analysis integrating data from 82 publications found that cover crops and intercropping significantly enhance the abundance of arbuscular mycorrhizal fungi (AMF) in agricultural soils, offering valuable insights for optimising agro-ecosystems. Tillage has been identified as one of the most damaging factors for beneficial soil fungi: it physically destroys mycorrhizal mycelial networks and the soil structure that protects them, with conservation or no-tillage practices shown to improve AMF diversity, abundance, and carbon sequestration potential.

Chemical inputs also pose additional threats. Fungicides such as azoxystrobin inhibit the spore germination of AMF species, and excessive fertiliser application reduces plant dependence on mycorrhizal associations, weakening these ecologically critical relationships. Heavy fungicide use also has wider consequences, driving antifungal resistance in fungi that threaten crops and human health. Despite this evidence, the impacts of farming practices on wild beneficial fungal communities beyond AMF remain poorly understood and are rarely integrated into farm management advice or agricultural policy.

Some companies are now working with the fungi already present in a farm's soil. MykoMatch, for example, isolates native Trichoderma strains from a client's own soil, selects the most effective one, and returns it as a spore solution. Implementing and monitoring practices that enhance fungal communities, including reducing tillage, increasing plant diversity through cover crops and diverse rotations, substituting organic for mineral fertilisers, and reducing chemical inputs, is essential for maintaining the fungal biodiversity that underpins long-term agricultural productivity, soil health, and ecosystem services.

Bringing fungi into public view

TARGETS 20



Slime mould (*Physarum* sp.). Photo: TommyIX/Getty Images via Canva

Geographic scope
Global

Type
People and capacity

Relevant to
Botanic gardens, zoos, and museums

Fungi remain largely absent from the institutions that shape public understanding of biodiversity, reinforcing the misperception that life consists of two kingdoms only. Where they have been given prominence, public interest has been substantial. In 2019, the Paris Zoological Park dedicated an exhibit to the slime mould Physarum polycephalum. Although slime moulds are not fungi, the exhibit drew international attention, showing public appetite for organisms beyond plants and animals. At the RHS Chelsea Flower Show, which reaches around 145,000 visitors and is covered on BBC television, fungi have featured in different forms: Caley Brothers have won multiple RHS Gold Medals for their immersive mushroom exhibits, while the gold medal-winning Avanade Intelligent Garden in 2025 featured a pavilion clad in mycelium-bonded panels, bringing fungal materials to a mainstream horticultural audience.

Film and digital media can extend this reach further, as was the case with the IMAX documentary Fungi: Web of Life, which has been screened through museums, science centres, and planetaria worldwide. Digital approaches do not depend on maintaining living cultures and can show belowground networks and microscopic diversity that cannot otherwise be exhibited. Governments, mycologists, and others implementing this Strategy are encouraged to partner with botanic gardens, zoos, aquaria, and museums to give fungi a lasting place in biodiversity interpretation, building the public understanding on which long-term political and financial support depends.

Capacity-building and cooperation

TARGETS 20



Underground Explorer sampling soil in the Humid Chaco, Formosa, Argentina. Photo: Pablo Adrián García-Parisi

Fungi have received only a small share of conservation funding, although some funders now include them within their programmes. Since at least 2011, the Mohamed bin Zayed Species Conservation Fund has awarded more than US$870,000 in small grants for fungi, many in the Global South, supporting both local conservation projects and Red List assessments.

Some programmes combine funding with technical support. Since 2022, the Underground Explorers Program of the Society for the Protection of Underground Networks (SPUN) has supported researchers, including Indigenous Peoples and local communities, to map mycorrhizal fungi in under-studied regions, with 81% of grants going to Global South researchers and more than half led by women. Explorers define their own research questions and decide how their data are used, while SPUN provides funding, sequencing, and technical support. The programme offers a replicable model for how scientific cooperation and equitable access to technology and funding can build the capacity needed to integrate fungi into national biodiversity strategies.

Geographic scope
Global

Type
People and capacity

Relevant to
Funders, Conservation organisations, and Researchers

Other funders and conservation organisations are encouraged to follow these examples by naming fungi explicitly in their priorities, calls for proposals, and reporting.

Mycological societies as conservation agents

TARGETS 20

Geographic scope
Global

Type
People and capacity

Relevant to
Communities, Funders, Governments

Mycological societies and amateur clubs can play a fundamental role in fungal conservation, serving simultaneously as knowledge repositories, capacity-building networks, community science engines, and trusted partners for government agencies and researchers. At the global level, the International Mycological Association, founded in 1971, serves as the umbrella body representing over 30,000 mycologists worldwide and connecting national and regional societies across all continents, making it a critical coordination point for advancing fungal conservation at the international scale. The International Society for Fungal Conservation, founded in 2010, was the first society devoted exclusively to protecting fungi, with aims that include building a network of national and local fungal conservation groups and identifying threats to fungi and important areas for them. A recent mapping of mycological organisations across Europe found that formal societies are not only coordinators of local mycological activities but also facilitators of international collaboration, enabling access to external funding, hosting public events, and enhancing the credibility of fungal conservation efforts.

For example, the European Council for the Conservation of Fungi, founded in 1985, now brings together mycologists from nearly every European country. In South America, the South American Mycorrhizal Research Network integrates researchers from across the continent to assess mycorrhizal biodiversity and address the historic shortage of research connections in the region. The African Mycological Association promotes mycology across the continent and has established a dedicated working group on fungal conservation, linking mycologists towards the common goal of adding African fungi to the IUCN Red List. These are just a few examples from the many national and regional societies that exist across different regions.

Governments, conservation practitioners, and funders implementing this Strategy are strongly encouraged to identify, engage, and resource these societies and networks as essential partners that hold irreplaceable local knowledge, community trust, and long-term data.

The Fungal Conservation Pledge

TARGETS 20



UK and Chile co-launch the Fungal Conservation Pledge at COP16, Cali, Colombia. Photo: Giuliana Furci

At CBD COP16 in Cali, Colombia, in October 2024, the governments of Chile and the United Kingdom, in collaboration with the Fungi Foundation, launched the Fungal Conservation Pledge. This pledge calls on governments to recognise fungi as an independent kingdom of life in national and international legislation, policies, and agreements, and to adopt concrete measures to maintain their benefits to ecosystems and people.

The co-launch between countries of the Global South and Global North represents a significant milestone, directly linking fungal recognition to the goals of the Kunming-Montreal Global Biodiversity Framework. The Global Strategy for Fungal Conservation provides the framework and voluntary actions needed to translate the ambitions of the Fungal Conservation Pledge into concrete implementation.

Geographic scope
Global

Type
Policy and law

Relevant to
Governments

Tools and resources - fungi specific

Resource	Key targets
Index Fungorum Nomenclatural data for the scientific names of fungi	All
Species Fungorum Global checklist of accepted scientific names of fungi	All
MycoBank Nomenclatural and taxonomic database for fungal names, interoperable with Index Fungorum	All
Fungal Names Registration and nomenclatural data for new scientific names of fungi	All
Freshwater Fungi Taxonomic classification, genus and species accounts, molecular data, and phylogenetic information for all known freshwater fungal taxa	All
Marine Fungi Taxonomy, species descriptions, distributions, molecular data, and genome information for marine fungal species	All
Cybertruffle Free online source of information about fungi and their associated organisms, including fungal names, occurrence records and mycological literature.	All
National fungal data portals National and regional databases of fungal names, records, and distribution, such as SwissFungi (Switzerland), Fungimap (Australia), and Flora e Funga do Brasil (Brazil)	All
MaarjAM Database of arbuscular mycorrhizal fungal (Glomeromycota) DNA sequences from ecological and taxonomic studies, searchable by taxon, host plant, location, and biome	All
FungalTraits Dynamic functional trait database for the world's fungi	All
Fungal Conservation Tracker A country-by-country overview of global fungi conservation (in progress)	All
IUCN SSC Fungal Conservation Committee Includes a list of relevant literature for fungal conservation and restoration	All
Guide for Organisations Adopting a Mycologically Inclusive Approach Provides guidance on integrating mycological language into organisational practices	All
Ethnomycology Ethical Guidelines A framework of ethical principles that offer guidelines with broad applicability for ethical decision-making in global mycology	All
Global Soil Biodiversity Initiative Educational, research, and policy resources on soil biodiversity, including fungi	All
FungalRoot Database of plant mycorrhizal associations and root colonisation	1 2 3 4

Resource	Key targets
INCEA mycorrhizal baseline dataset and protocols Open data on mycorrhizal diversity across habitats in England, with the protocols used to collect it	1 2 10 11
GlobalFungi Global database of fungal occurrences from high-throughput-sequencing metabarcoding studies	1 3 4
MyCoPortal Portal providing access to digitised fungal specimen records from participating fungaria	1 3 4
Unite Database and sequence management environment centred on the eukaryotic nuclear ribosomal ITS region	1 3 4
MoSTFun protocols and pipelines Protocols and analysis pipelines for monitoring marine and freshwater fungi	1 3 4
Senn-Irlet *et al.* 2007 Guidance for the conservation of macrofungi in Europe, prepared for the Council of Europe by the European Council for the Conservation of Fungi	1 3 4
SPUN Underground Atlas High-resolution global maps with mycorrhizal fungal biodiversity predictions at a 1 km2 resolution	1 3
A Hidden Infrastructure Global map of the predicted density of arbuscular mycorrhizal fungal networks at a 1 km^2 resolution	1 2
FUNGuild Free, open-access database and analysis tool that identifies the ecological roles of fungi	2 4 10 11
MycorrhizaFinder AI tool for rapid assessment of endomycorrhizal fungal colonisation of plant roots	2 10 11
Global Soil Biodiversity Atlas Illustrated global overview of soil organisms, including fungi, the functions they support, and the threats they face	2 10 11
The Global Fungal Red List Initiative Initiative to facilitate and coordinate efforts to assess and document threatened fungal species for inclusion on the IUCN Red List of Threatened Species	4
Dahlberg and Mueller 2011 Guidelines on applying IUCN Red List criteria for assessing the extinction risk of fungal species	4
Yahr et al. 2024 Guidelines on applying IUCN Red List criteria for assessing the extinction risk of lichens	4
Edible Fungi of Tropical Africa Checklist of edible fungi from Tropical Africa with information on ecology, taxonomy, and known distribution	4 5 9
Drewinski et al. 2024 Evidence-based list of 409 wild edible mushrooms recorded in Brazil, with the full checklist available as supplementary material	4 5 9
Boa 2004 FAO global overview of wild edible fungi, covering their use, trade, and importance to livelihoods, with a chapter on managing wild edible fungi, trees, and forest users	4 5 9

Tools and resources - general

Resource	Key targets
GBIF (Global Biodiversity Information Facility) Open-access global infrastructure aggregating biodiversity occurrence records, including fungal records from fungaria, community science platforms, and research datasets	All
Index Herbariorum Global directory of herbaria and fungaria, including holdings and contacts	All
Essential Biodiversity Variables (EBVs) GEO BON framework of the essential measurements needed to track and report change in biodiversity, used to design monitoring systems and indicators	All
GSAP SKILLS IUCN online knowledge platform providing target-by-target guidance, tools, resources, and case studies to support the GBF implementation	All
IPBES Assessments Authoritative global assessments on the state of biodiversity and ecosystem services	All
Species Threat Abatement and Restoration (STAR) IUCN metric that quantifies how abating threats and restoring habitat at specific locations could reduce global species extinction risk, calculated from Red List data and used to guide spatial prioritisation	1 2 3 4
IUCN Red List of Ecosystems Global framework for assessing the risk of ecosystem collapse, with criteria covering declining distribution, environmental degradation, and disruption of biotic processes and interactions	1 2 3
Key Biodiversity Areas Globally significant sites for conservation identified on the basis of their importance for species, including fungi, with tools and guidance to support their identification, monitoring, and protection	1 3 4
SER Standards, Guidelines, and Principles Global standards for planning, implementing, and monitoring ecological restoration	2
The Global Biodiversity Standard Methodology and criteria for assessing whether tree planting, habitat restoration, and agroforestry projects protect, restore, and enhance biodiversity	2
Restor Open-data geospatial platform with site-specific ecological data, monitoring tools, and funding opportunities to plan, implement, and track ecosystem restoration projects	2
Gerrits et al. 2023 Synthesis of the effectiveness of soil translocation for restoring plant communities	2
IUCN Guidelines for Reintroductions and Other Conservation Translocations Designed to be applicable to the full spectrum of conservation translocations, provide guidance on the justification, design, and implementation of any conservation translocation	2 4
Center for Plant Conservation Best Practices Best-practice guidance for plant conservation that could serve as a model for equivalent fungal guidance	2 4

Resource	Key targets
FAO Soils Portal Knowledge hub providing data, assessment tools, publications, and policy guidance on soil health, biodiversity, management, and restoration	2 7 10 11
IUCN Red List of Threatened SpeciesTM The most comprehensive inventory of the global conservation status of species, providing extinction risk assessments, population trend data, and information on threats and conservation actions	4
The National Red List Project Global hub aggregating national, subnational, and regional Red List assessments across taxonomic groups, including fungi	4
NatureServe Explorer Conservation status ranks for species and ecosystems in the Americas, including some fungi and lichens	4
BGCI resources Databases and guidance for botanic gardens, including a global directory of gardens and experts, and manuals on species conservation and managing living collections that could be adapted for fungi	4 20
IUCN Guidelines on Responsible Translocation of Displaced Organisms Guidelines covering decision-making, feasibility assessment, and implementation for animals, plants, and fungi displaced by climate-driven disasters, human development, or unsustainable trade	4 5 8
Species Use Database global database with information on how wild species are used, where they are used, if that use is sustainable or unsustainable, and what impacts that use is having	4 5 9
CABI Compendium Consolidates data and research on various species, pests, and diseases into a single comprehensive resource, featuring images, maps, and access to decision-support tools such as The Horizon Scanning Tool, Pest Risk Analysis Tool, and the Invasive Species Discovery Too	4 6 10
Plants for Health RBG Kew resource on the names and published information for plants and fungi used in health products	5 9
FairWild Standard Certification standard for the sustainable and fair wild collection of plants and fungi, covering ecological, social, and trade criteria	5 9
UNCTAD BioTrade UNCTAD principles, criteria, and guidance for trade in goods and services derived from biodiversity	5 9
Global Register of Introduced and Invasive Species (GRIIS) IUCN-led global dataset of country-level checklists of introduced and invasive species across all major taxonomic groups, including fungi	6
Global Invasive Species Database Information about invasive non-native species that negatively impact biodiversity, facilitating effective prevention and management activities	6
Environmental Impact Classification for Alien Taxa (EICAT) IUCN established global standard for measuring the severity of environmental impacts caused by animals, fungi, and plants living outside their natural range	6
IUCN Global Standard for Nature-based Solutions IUCN framework for designing, evaluating, and implementing nature-based solutions	7 8 10 11



GLOBAL STRATEGY FOR FUNGAL CONSERVATION

It cannot be done without fungi...

globalfungalconservation.org
Global Fungal Conservation Network