



EDITORIAL

Global scientific collaboration under strain — implications for soil biodiversity research and conservation

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The foundational role that soils play in sustaining terrestrial ecosystems is unequivocal: soils harbor an astonishing diversity of life (Anthony et al. 2023) that underpins nutrient cycling, water regulation, food production, climate regulation, and myriad ecosystem services essential to human well-being and planetary health (Eisenhauer et al. 2026). Yet, while soil biodiversity arguably comprises one of the largest reservoirs of biological diversity on Earth, it remains chronically under-represented in global policy and conservation frameworks despite growing scientific evidence of its ecological importance (Guerra et al. 2021). In this context, recent geopolitical developments described in a *Nature News* report (20 January 2026; Castelvechchi & Masood 2026) — in which the United States announced its intention to withdraw from 66 international organizations, including key scientific and environmental bodies — carry profound implications for the global science infrastructure that supports research on soil biodiversity and its conservation.

At the same time, other regions are moving in the opposite direction. The *Directive on Soil Monitoring and Resilience* („Soil Monitoring Law“) by the European Union signals an emerging model in which soil biodiversity monitoring becomes embedded in binding regulatory frameworks. This contrast underscores a central question for the soil biodiversity community: how can we build collaborative and monitoring systems that remain robust and effective despite political volatility?

Shifts in Global Scientific Networks

The decision by the United States involves withdrawal from numerous United Nations agencies and intergovernmental scientific collaborations, including major environmental and biodiversity-related institutions, such as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and the International Union for Conservation of Nature (IUCN), as well as bodies central to global environmental assessments and science-policy integration. IPBES has served as a crucial mechanism for

synthesizing biodiversity science for policymakers, while IUCN functions as a key hub for global conservation data, standards and assessments.

These departures risk fragmenting the international fora in which soil scientists previously collaborated to share data, align monitoring protocols, and integrate soil biodiversity into global assessments of ecosystem health. The absence of one of the largest national research communities and funders from these platforms could reduce the diversity and scale of data flows that underpin global soil biodiversity knowledge. This change comes at a particularly critical moment, when



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global soil biodiversity research is beginning to coalesce around shared observatories, harmonized methodologies, and coordinated assessments (Guerra et al. 2024).

Implications for Soil Biodiversity Science

1. Data Integration and Policy Translation

International collaboration facilitates the integration of disparate datasets covering soil organisms from bacteria and fungi to micro- and macrofauna — a necessity for constructing meaningful global soil biodiversity baselines, detecting change, and informing conservation action (Eisenhauer et al. 2021). International collaboration is essential for integrating datasets covering soil organisms — from bacteria and fungi to micro- and macrofauna — into coherent global baselines. These baselines are necessary to detect change, attribute drivers, and identify conservation priorities (Eisenhauer et al. 2021).

A withdrawal of major actors from global platforms will, inevitably, slow progress in: harmonizing sampling and molecular protocols; establishing interoperable data standards; maintaining long-term soil biodiversity observatories; and integrating soil indicators into broader biodiversity monitoring systems. Without robust, internationally comparable data, soil biodiversity may continue to be sidelined in global biodiversity targets and conservation planning (Zeiss et al. 2022).

Insights from recent research emphasize the urgent need to bridge scientific knowledge with governance frameworks capable of monitoring and sustaining soil organism diversity (van der Putten et al. 2023). While embedding soil biodiversity indicators in regulatory and monitoring systems is essential, durable political commitment is unlikely to emerge from scientific recommendations alone. Long-term progress also depends on strengthening societal awareness of soils and their biodiversity. Developing “soil literacy” — the understanding of soils as living systems that underpin food security, climate regulation, and ecosystem resilience — is therefore a critical complementary strategy.

Achieving this requires sustained investment in education and public engagement across multiple levels. Educational resources that introduce soil biodiversity concepts from early schooling through higher education can help build a generation of citizens that recognizes the importance of soil life (Beugnon et al. 2024). While barriers to effective education in soil health exist, gaps are being (LOESS Project, <https://loess-project.eu>), and need to continue to be, addressed (Roca Vallejo et al. 2025). In parallel, outreach initiatives, participatory monitoring programs, and science communication efforts that connect soil biodiversity to everyday experiences (e.g., food production, gardening, or climate mitigation) can foster broader public support. By engaging citizens — the constituencies that ultimately shape

political priorities — such bottom-up approaches can reinforce policy initiatives and create the societal demand necessary to sustain soil biodiversity monitoring and conservation efforts over the long term.

2. Collaborative Research and Capacity Building

Multilateral platforms have historically underpinned collaborative soil ecology research, training networks, and the co-development of monitoring standards. Reduced engagement may widen existing geographical and taxonomic knowledge gaps — particularly in tropical and under-sampled regions (Guerra et al. 2020) — and weaken our understanding of how soil biodiversity responds to global change drivers (Phillips et al. 2024).

To counteract this, the soil biodiversity community could: expand regional research hubs (e.g., pan-European, pan-African, pan-Latin American networks) that operate semi-autonomously yet coordinate globally; develop joint doctoral and postdoctoral training programs co-funded by multiple countries to reduce dependence on single national funding streams; promote South–North and South–South partnerships that prioritize equitable data ownership and authorship; and create portable training modules (such as NBSOIL, <https://nbsoil.eu/>) and open-access methodological toolkits for soil biodiversity assessment. Building human and institutional capacity across regions not only strengthens science but also creates distributed leadership structures that are less vulnerable to geopolitical shifts.

3. Conservation Outcomes and Policy Influence

While data integration focuses on generating and harmonizing knowledge, conservation outcomes depend on how that knowledge is translated into binding or incentivized action. Organizations such as IPBES and IUCN play an outsized role in shaping national biodiversity strategies and funding priorities. Soil biodiversity — already under-recognized in many national strategies (Guerra et al. 2022) — could see its profile further reduced if global assessments lose influence.

To enhance resilience at the policy level, soil scientists and institutions could: advocate for the explicit inclusion of soil biodiversity targets and indicators in National Biodiversity Strategies and Action Plans (NBSAPs); align soil biodiversity metrics with Sustainable Development Goals, climate mitigation targets, and land restoration commitments; collaborate with agricultural ministries to integrate soil biodiversity into subsidy schemes, certification standards, and regenerative farming policies; and develop clear, policy-ready guidance documents (e.g., threshold values, risk categories, management recommendations) that policymakers can directly operationalize.

In practice, political change–resilient systems are those where soil biodiversity monitoring and conservation are embedded in cross-sectoral regulations (agriculture, climate, land use), supported by diversified funding streams, and anchored in both regional and global governance frameworks. Such institutional embedding reduces reliance on single political actors or administrations.

A Call to the Soil Biodiversity Community

The soil science community should respond proactively to emerging geopolitical dynamics by:

1. Institutionalizing soil biodiversity monitoring within binding regional frameworks and national legislation.
2. Building distributed, interoperable data infrastructures that persist independently of individual political alignments.
3. Diversifying funding portfolios, including philanthropic foundations, multi-country consortia, and public–private partnerships.
4. Strengthening regional leadership and training networks to ensure continuity of expertise and collaboration.
5. Producing concise, policy-oriented syntheses and indicator dashboards that make soil biodiversity visible in decision-making arenas.

Rather than relying exclusively on a small number of global intergovernmental bodies, the community should cultivate a polycentric governance model — one in which multiple overlapping institutions, networks, and funding streams collectively sustain progress.

Conclusion

The 2026 declaration by the United States to withdraw from many global science and environmental institutions represents a significant shift in the landscape of international scientific collaboration. For the soil biodiversity community, this moment highlights the importance of designing monitoring systems, data infrastructures, and governance interfaces that are robust to political volatility.

Encouraging developments, such as the EU's move toward legally binding soil monitoring, demonstrate that soil biodiversity can become firmly anchored in regulatory frameworks. The challenge ahead is to ensure that such advances are complemented by globally connected, yet institutionally resilient, networks. By embedding soil biodiversity within durable policy structures, diversifying collaborations, and strengthening distributed scientific leadership, the community can safeguard the diversity of life beneath our feet — and

reinforce the essential bridges between science, policy, and society needed to confront accelerating global change.

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