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C O L L O Q U I U M

Turning Data into Decisions by Bridging Mathematics, Ecology, and Policy

Dr Sandra MacFadyen (Stellenbosch University)

DATE: Monday, 13 October 2025 | 16h00–17h00 SAST

VENUES:

- **Stellenbosch University:** NITheCS Seminar Room, Merensky Building
- **North-West University**: Seminar Room K310, Physics Building G5
- **University of the Witwatersrand**: Room P215, 2nd Floor, Physics Building
- **Online**

--- A recording of the talk will be published on the NITheCS YouTube channel afterwards ---

ABSTRACT

Biodiversity loss is one of the defining challenges of our time. Yet monitoring biodiversity change across regions, scales, and taxonomic groups remains complex, making it difficult to deliver metrics that are consistent, interpretable, and usable across science and policy. The EU-funded Biodiversity Building Blocks for Policy (B-Cubed) programme works in close collaboration with the Mathematical Biosciences Lab (BioMath) and NITheCS research programme Ecological Complexity & Biodiversity (E5-WP1). Together, these initiatives aim to harmonise biodiversity metrics, build FAIR and model-ready datasets, and create adaptable open-source workflows that bridge ecological research and decision-making.

This colloquium will introduce our joint vision to deliver transparent workflows and open-source software for broad application, including regionally tailored biodiversity monitoring strategies. Emphasis will be placed on how these approaches translate ecological complexity into policy-relevant insights, spanning from global indicators to locally meaningful measures. This includes applying mathematical models to simplify and quantify biodiversity processes, revealing emergent ecological patterns, advancing methods for analysing adaptive ecological networks, and mapping biodiversity turnover across scales. Some of the methodological advances from this collaboration will all be outlined, including new R packages for compositional dissimilarity and invasibility analyses. These tools illustrate how open, collaborative science can support biodiversity monitoring and guide conservation action. Together, B-Cubed, E5-WP1, and BioMath demonstrate the power of linking mathematics, ecology, and policy to better understand and manage biodiversity change.

BIOGRAPHY

Dr Sandra MacFadyen is a postdoctoral research fellow with the Mathematical Biosciences Lab (BioMath) at Stellenbosch University (SU). She holds a PhD in Botany (SU) and Landscape Ecology (Vrije University Amsterdam), an MSc in Geographic Information Science, and postgraduate degrees in Nature Conservation. Dr MacFadyen is a core team member of the B-Cubed programme, a research associate at NITheCS, and principal investigator of Work Package 1: Ecological Complexity & Biodiversity in the NITheCS E5 research programme on Complexity in Biological Systems. Her research focuses on harmonising biodiversity metrics across scales, modelling ecosystem change under climate drivers and developing open-source tools for biodiversity monitoring. With over 25 years based in Kruger National Park, she specialises in macroscale ecosystem dynamics and applied spatiotemporal statistics for conservation. She is passionate about bridging science, policy, and practice to advance biodiversity monitoring and ecological understanding.

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