

# RESEARCH CONNECTION

## Getting to know the Environmental Science Lab

By Alex Koiter, PhD, David Greenwood, PhD, & Terence McGonigle, PhD



### What you need to know

The Environmental Science Lab (ESL) is a research facility based at Brandon University. The ESL is the result of a funding partnership between the Canada Foundation for Innovation and the Manitoba Research and Innovation Fund of the province of Manitoba. Since opening in 2008, the ESL has provided access and training on analytical and microscopy instrumentation for faculty and graduate student research projects. The ESL has two primary focuses: supporting the study of contemporary environmental issues and facilitating paleoenvironmental reconstruction.

### Why this research is important

As the global population continues to grow, the pressures on our environmental systems and resources to meet this increasing demand also intensify. Consequently, environmental science research is becoming increasingly important due to the complexity of current environmental challenges within the Prairies and globally. A key aspect of this is paleoenvironmental research, which helps us understand how ecosystems and climates have responded to past environmental changes, providing valuable insights into natural processes and human impacts over time. The discoveries and innovations supported by the ESL help address global concerns surrounding the sustainability of food systems, climate change, resource development, emerging pollutants, and access to clean water.

### How the research is conducted

Environmental science is inherently interdisciplinary where environmental issues and research questions are investigated through the lenses of the four interconnected parts: biosphere, hydrosphere, lithosphere, and atmosphere. Addressing environmental issues is complex, and a one-size fits most approach rarely achieves all the desired socio-economic needs and environmental outcomes. In many cases, management decisions designed to address a particular issue often have unintended consequences. These trade-offs highlight the importance of having a interdisciplinary approach when addressing these environmental concerns and, as a result, have fostered collaborative research projects.

The ESL has supported a wide range of research projects conducted by faculty, postdoctoral fellows, graduate ([MSc Environmental & Life Sciences](#)) and undergraduate students, and research assistants across several Faculty of Science departments. Projects have included mycorrhizal ecology, soil-plant relations, soil carbon sequestration, nutrient management, water quality/chemistry, soil erosion and sedimentation, palaeo-palynology, and palaeobotanical proxies of climate. In addition to the basic lab equipment, the ESL has been able to support these projects by providing access and training to state-of-the-art analytical equipment that allows researchers to analyze soil, water, and plant tissue samples for elemental composition (e.g., Ca, K, Na, Mg, P, Mn, Zn, Fe, Cu, Mo), organic and inorganic Carbon content, and nutrient content (e.g., Nitrate, Nitrite, Ammonia, Phosphate). The microscopy suite (including fluorescence) and image analysis software allow for the microscopic examination of environmental samples, such as plant material, soil, leaf litter, fossil deposits, paleobotanical specimens, and archaeological materials.

### How this research can be used

The ESL-supported research generates knowledge about the environmental impacts of human activities, works towards sustainability by developing innovative solutions to complex environmental issues, and can inform and guide regional, national, and global environmental policies.

### About the Members of the ESL

**Dr. David Greenwood** is a co-founder of the ESL and manages the Microscopy Suite. He is a professor (retired) in the Department of Biology at Brandon University, specializing in using the fossil record of terrestrial plants (fossil leaves, pollen and spores) to reconstruct climates of the geological past and the forest ecosystems they represent.

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**Dr. Terence McGonigle** is a co-founder of the ESL and manages the Analytical Suite. He is a professor in the Department of Biology at Brandon University specializing in plant biology and soil microbiology and the effects of soil conditions on plant growth in agricultural ecosystems.

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**Dr. Alex Koiter** is an associate professor in the Department of Geography & Environment at Brandon University and a frequent user of the ESL. He has expertise and experience in a range of agri-environmental systems. His research program focuses on land and water management practices and their implications for soil and water quality. His research group investigates agricultural issues, including soil erosion, downstream sedimentation, nutrient dynamics, greenhouse gas fluxes, and extremes of moisture.

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### Keywords

Environmental science, laboratory, analytical equipment, microscopy, soil, water & plant analysis

### For more information about the ESL, please visit:

<https://www.brandonu.ca/enviroscience-labs/>

<https://www.youtube.com/watch?v=id26fBDf3ak>

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