569 South Academic Building
University of Alberta
Edmonton, AB T6G 2R3
Swamp.ualberta.ca

The SWAMP Laboratory: A metal-free, ultraclean research facility in the South Academic Building (SAB) for studying trace element cycling at interfaces: soil, water, air, manure, plant (SWAMP). Constructed entirely of polypropylene and fed by an external air handling unit with HEPA filtration, the SWAMP facility consists of 3 separate clean rooms:

SAB 563
Class 10,000 room for sample preparation, with 5 laminar flow, Class 100 clean air benches (3 of which are exhausted, to permit use of concentrated acids). This room contains an ultrapure water system (Milli-Q Element, Millipore), a quartz distillation unit for preparation of high purity nitric acid (duoPUR, MLS), and high-pressure microwave digestion instrument (ultraCLAVE II Microwave Autoclave, MLS).

SAB 558
Class 1,000 room for chemical separations and mass spectrometry, with 6 Class 100 clean air benches. This room contains two inductively coupled plasma-mass spectrometers: a quadrupole instrument (ICAP Qc, ThermoFisher) and a sector-field instrument (Element XR, ThermoFisher) with micro volume autosampler (ASX 100, Cetac Technologies), microflow PFA nebulizer and high-efficiency sample introduction system (APEX IR, Elemental Scientific Inc.). The ICAP instrument is coupled to an aysmmetric flow-field flow-fractionation instrument (AF 2000 MF Postnova Analytics) complete with UV, molecular fluorescence, and light scattering detectors to allow trace elements to be determined as a function of molecular size, and to allow detailed characterization of colloids. A G SPLITT system is used for separation of larger particles (1 to 300 µm) and includes an optical particle counter.

SAB 555
Class 100 room for working with biological tissues, and containing 4 clean air benches (with ULPA filtration).
A Lighthouse portable, hand-held, laser particle counter (3016 IAQ) is used to monitor air quality each month, but we have not yet detected any particles in any of the cabinets.

The SWAMP laboratory is also home to a complete sample preparation laboratory, with drying oven, microwave ashing furnace (MLS Pyro), and two grinding mills: a centrifugal ball mill which uses agate jars and balls (Pulverisette 5) and titanium centrifugal mill (Ultracentrifugal mill), both from Retsch. A stainless steel band saw with purpose-built polypropylene cutting table allows precise slicing of frozen peat cores. The preparation laboratory includes a walk- in refrigerator (4 C) and freezer (-18 C). A separate room with rolling storage shelves houses our collection of dried samples of moss and peat from around the world.

Finally, the SWAMP laboratory also includes a separate room with three ultralow background gamma ray spectrometers (Ortec) for measuring fallout radionuclides (^{137}Cs, ^{210}Pb, ^{241}Am).

To support our field campaigns, we have a 4WD diesel pickup truck (Dodge RAM HD2500) with 24 ft trailer, two quads (Can Am 850) with snow tracks for accessing remote peatlands, and for snow sampling, plus a jet boat (Lowe) with 110 hp engine (Mercury) and trailer.

For peat sampling, we have an improved Wardenaar-style peat monolith corer (for coring the uppermost peat layers) built using a titanium alloy (VT6 which contains 6.2% Al and 3.9% V). For deeper peat layers, we have two Belarus-style peat cores, one constructed using surgical stainless steel, the other using a titanium alloy; both include 10 m of extension rods. We have a complete set of groundwater monitoring equipment (stainless steel as well as polypropylene drive point wells), as well as lysimeters for sampling soil solutions, custom-built in surgical stainless steel (5 µm pore size). All of our custom-built tools are designed and constructed by Mr. Tommy Noernberg, our mechanical engineering technologist who brought with him from Denmark a complete mechanical workshop.