Ecotoxicology and Risk Assessment Facilities –
A Quick Visual Tour

Ecotoxicology and Risk Assessment Activities

This VIMS group intentionally addresses diverse issues ranging from statistical analyses, to ecological effects modeling, to human risk from contaminants in finfish and shellfish, to mercury biomagnification in aquatic and terrestrial food webs. In addition to using teaching and computational resources, and a wide range of analytical and animal testing facilities elsewhere on the VIMS campus, it has its own set of three laboratories focused on measuring contaminant concentrations in various environmental media and contaminant effects on living organisms, including humans.

Trace element contamination and associated risk are a consistent research theme and, accordingly, the Ecotoxicology and Risk Assessment laboratory facilities emphasize trace element analysis. The associated three rooms provide ample equipment, instrumentation, and space for general sample preparation and storage, ultraclean acid and water generation, clean space for low level analytical studies, and general analysis of samples for metals, metalloids, and various other contaminants.

Andrews Hall

The VIMS Ecotoxicology and Risk Assessment facility is housed in the newly constructed (2008) Andrews Hall. The facility includes laboratories (Rooms 401, 402, and 404) with classrooms, and offices within 10 meters.

New Andrew Hall classrooms immediately adjacent to the Ecotoxicology and Risk Assessment laboratories are equipped with distance learning capabilities and overlook the mouth of the York River.

Trace Element Analysis Laboratory (Room 401)

A variety of analytical and measurement activities occur in this laboratory. It is amply equipped with basic resources such as top loader and analytical balances, fume hoods, and pH meters. Metals and metalloids can be analyzed routinely with a Perkin-Elmer atomic absorption spectrophotometer which is fully automated for flame, transversely-heated graphite furnace, hydride generation (arsenic), and cold vapor (mercury) FIAS.

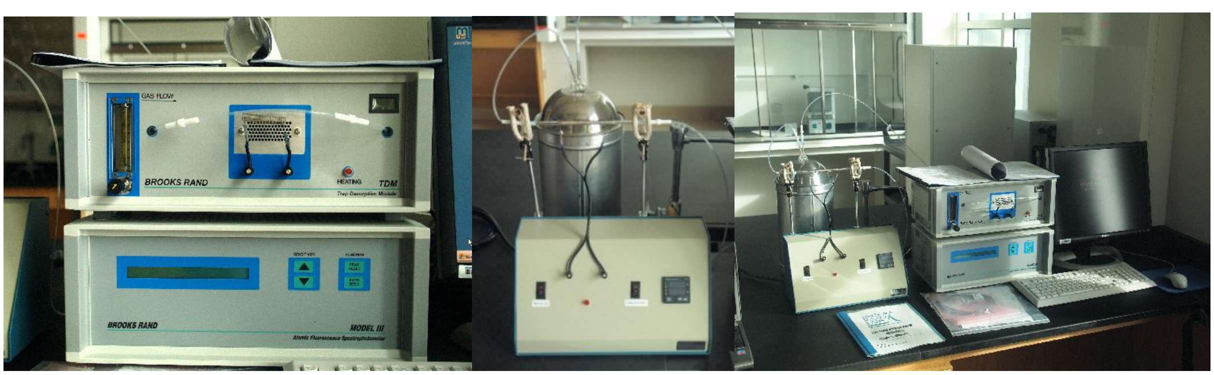
A dedicated direct mercury analysis unit is also available which can directly analyze a variety of solid samples with minimum preparation and chemical waste generation. Instrumentation for methylmercury analyses have recently been added to the laboratory. Also available is a LemnaTec image analysis system used to quantify growth or movement effects of toxicants.

The Trace Element Analytical Laboratory is well equipped for a wide range of projects but has strong trace element capabilities.

A Perkin-Elmer atomic absorption spectrophotometer provides the central analytical capabilities of this laboratory. It includes a transversely-heated graphite furnace (shown in left image) which can be automatically shifted out of the light path to be replaced by a flame unit. Shown on the right is a FIAS unit for hydride generation and cold vapor analyses.

A Milestone DMA80 direct mercury analysis system was added to this facility five years ago. Solid or liquid samples are weighed onto a sample boat (right) and the weight is automatically entered into the data processing unit. Racks of samples can be analyzed with minimum sample preparation. The rack of samples shown on the left contains shark tissue standard material used to assure high data quality (slots 4 and 5) and muscle samples from deep ocean sharks which contain surprisingly high mercury concentrations. On the right is Erica Holloman, a former PhD student who assessed risk from mercury associated with seafood consumption in a Newport News, VA, African-American community.


Extraction and ethylation equipment used to prepare water, sediment, soil, and biological samples for methylmercury analysis.



Brooks Rand thermal decomposition, GC separation, and atomic fluorescence instrumentation used for methylmercury measurement.

Although trace element analysis is a central theme, other capabilities are available including the LemnaTec image analysis system shown on the left and the Beckman DU703 UV-VIS spectrophotometer shown on the right. The UV-VIS spectrophotometer permits a wide range of analyses, including those involving kinetics and microsampling.

Trace Element General Preparation Laboratory (Room 402)

Of course, before samples can be analyzed, they are received from the field, stored and processed. This room is used for those purposes and also to generate high purity acids for sample preparation.

In addition to low-contamination plastic and perchloric acid hoods, this room has storage freezers, a freeze drying unit (bottom right), and a Teflon high purity acid still (right top). It provides areas for field equipment storage and servicing, and general processing of samples as they arrive from the field.


Processing of some samples is inherently sloppy and requires dedicated space such as that provided in the General Preparation Laboratory. Typical are many samples taken in a currently-funded mercury trophic transfer study. In the left photograph above, MS student, Kyle Tom, holds clean plastic substrates and also plastic substrates that had accumulated periphyton for six weeks. He will scrap the periphyton from the substrates and prepare them for mercury, methylmercury, and stable N and C isotope analyses. Messy samples taken from the top of the food web also require a place for processing. In the right photograph, Prof. Mike Newman homogenizes a largemouth bass from the same biomagnification study.

Trace Element Clean Preparations Laboratory (Room 404)

Some samples, standards, glassware, and laboratory reagents require careful preparation in order to minimize trace element contamination. In this room, a Class 100 clean hood facilitates such activities. The laboratory also has a low-contamination, plastic fume hood, a Nanopure deionized water system, CEM microwave digestion unit, and ample clean counter space for diverse tasks such as water sample filtering or preparation of standards.



The Trace Element Clean Preparation Laboratory has low-contamination hoods (right), including a Class 100 hood (center of left photograph)in addition to a Nanopure deionized water system (bottom right) and a CEM microwave digestion unit (top right).