

The **SWAMP** lab at the University of Alberta offers to help residents of Flint, Michigan, understand the forms of lead in their water

## **BACKGROUND**

Lead is a potentially toxic “heavy metal”. In the drinking water from Flint, Michigan, unsafe levels have been found in many homes. Water that is safe to drink contains no more than 10 micrograms per litre (parts per billion) of lead. The water in many homes contain far greater values than this.

## **THE ANALYTICAL CHALLENGE**

Lead in water may occur in many different forms. To understand its potential toxicity, and to develop a strategy for its removal, it is essential to understand what form it is in. There are many technical reasons why it is difficult to characterize the forms of lead in water, and few labs are able to undertake these studies and generate reliable results.

## **THE SOLUTION**

The metal-free, ultraclean **SWAMP** lab at the University of Alberta is a multi-million dollar research facility for studying trace metals in **Soil, Water, Air, Manure and Plants** ([www.swamp.ualberta.ca](http://www.swamp.ualberta.ca)). This lab was designed and constructed to allow trace metals such as lead to be measured at the extremely low levels usually found in the pristine rivers and lakes of northern Canada. In addition to our ability to measure extremely low levels of trace metals in water, we have developed the technology to determine the physical and chemical forms of many elements, including lead, all at the same time.

## **THE FIRST OPPORTUNITY**

**Dr. Jerome Nriagu**, Professor Emeritus at the University of Michigan, is one of the foremost authorities in the world regarding lead in the environment and its significance for human health. Dr. Nriagu visited the University of Alberta in June of this year to receive an honorary doctorate for his outstanding contributions to science and humanity. During his stay in Edmonton, he also had a visit to the SWAMP lab and asked if we could help with the lead problem in Flint, Michigan: of course we agreed.

## **THE SECOND OPPORTUNITY**

**Dr. William Shotyk**, Bocock Chair for Agriculture and the Environment, is the founder of the SWAMP lab. Dr. Shotyk is also the President of the Elmvale Foundation, a federally registered charity for environmental education, and host of the annual Elmvale Water Festival ([www.elmvale.org](http://www.elmvale.org)). The reference water used in the SWAMP lab for quality control, is from the Elmvale Groundwater Observatory and contains only 1 nanogram per litre (part per trillion) of lead which makes it ideal for comparison.

## **THE FINANCIAL CHALLENGE**

The SWAMP lab with its sophisticated analytical technology and highly skilled technical personnel, is funded by research grants from the provincial and federal governments, and from industry. As these funds are all allocated for existing studies, the SWAMP lab on its own cannot begin to study the waters of Flint, Michigan without financial support.

## **HOW YOU CAN HELP**

A crowdfunding effort is underway to allow some preliminary sampling, analysis, and reporting. All funds raised will be paid directly to the research account of the SWAMP lab, and all of the funds raised through this effort will be used exclusively for the water samples from Flint, Michigan. For its part, the University of Alberta has generously agreed to support our efforts, and will contribute overhead costs.

## **FOR MORE INFORMATION**

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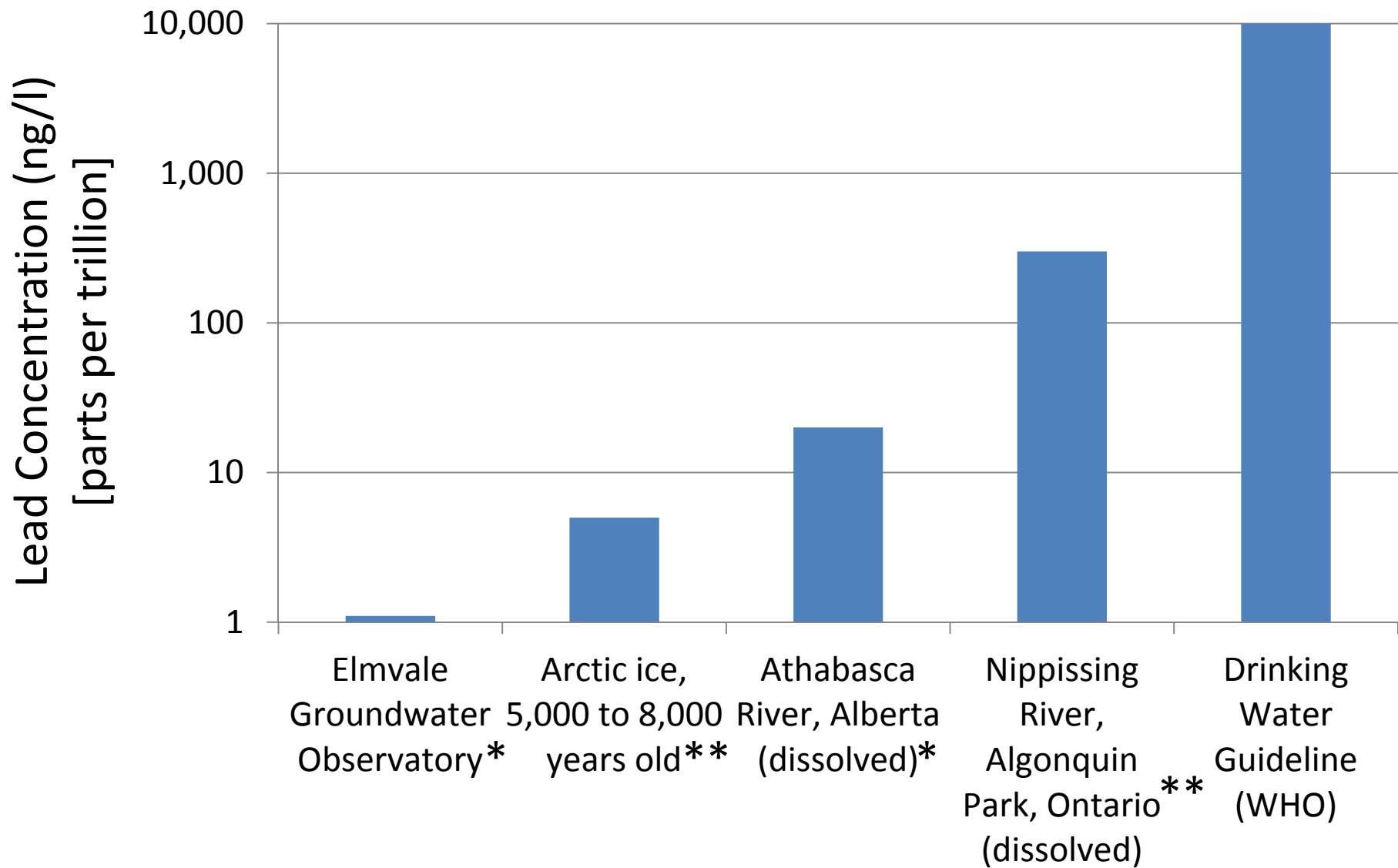
[www.swamp.ualberta.ca](http://www.swamp.ualberta.ca)

## **TECHNICAL BACKGROUND**

Wearing clean lab clothing, waters will be sampled using polypropylene (PP) bottles which are pre-cleaned in nitric acid which has been distilled twice, in quartz. Filters (0.45 micron PTFE) and syringes (PP) are all cleaned in nitric acid. Bottles are stored in two polyethylene (PE) bags before shipping to the USA.

Once the samples have arrived back in the SWAMP lab for testing, unfiltered waters will be measured for total lead (Pb) using ICP-MS (ICAP Qc, Thermo Fisher). In the filtered water samples, Pb will be measured as a function of molecular size using flow-field flow-fractionation (AF4, Postnova Analytics) coupled to ICP-MS. The AF4 includes a UV, molecular fluorescence and laser particle size analyzer as well, so organic and inorganic particles containing Pb can be clearly distinguished from one another.

## Lead in Perspective



\* SWAMP lab data, University of Alberta

\*\* Shotyk clean lab data, University of Heidelberg (Germany), 2000 to 2010