Introduction
The traditional monitoring of industrial effluent quality has relied heavily on two laboratory-based components. First of which is physical-chemical measurements to determine the "total" concentration of a particular analyte in the effluent. The second is gathering biological data in a form of a static non-renewable acute bioassay. With industrial effluents increasing in frequency, intensity and severity, increased research in new technologies has revealed that traditional effluent monitoring has the following limitations: (1) complicated, expensive and time consuming; (2) cannot measure chemical compounds below analytical detection limits; (3) does not present data regarding additive, subtractive, or synergistic toxic effects; (4) mainly use a grab sample, which neglects to provide a representative picture of the extent of contamination; (5) early detection of poor effluent conditions (e.g. result of accidental spill) is minimal; (6) use mortality as a test endpoint and disregard the concept of "ecological death".

Lakehead University has developed a new biomonitoring system that utilizes rainbow trout (Oncorhynchus mykiss) behaviour to rapidly detect acute levels of toxicity in industrial effluent. The Toxicity Early Warning System (TEWS). With full implication and success of the TEWS, the tools will be available to conserve and protect our water resources from the byproducts of industrial activities.

Research Objectives
- Quantify fish behavioral responses to reference toxicants and know complex effluents
- Implement TEWS in situ to monitor industrial effluent quality in real-time

Research Methods
- Employs fish behaviour sensors to detect the presence of acute toxic substances
- Fish are confined in flow-through test chamber which are exposed first to dechlorinated water (6 hour baseline), then are exposed to effluent (8 hour)
- Significant changes in ventilatory behavior and locomotion activities are detected through noninvasive electrodes in each tank
- Types of responses include: changes in fish whole body movement. En movement, increased ventilatory frequency, and increased cough frequency, all of which help indicate signs of stress
- Fish Signals are amplified, filtered, compared to reference chamber and interfaced to a computer where Windows software is used to analyze waveforms.
- Computer based algorithms continuously monitor and assess each fish's reaction to the effluent

Advantages of the TEWS
- Allows for real-time response to potentially toxic events year round
- Prevents industry from failing monthly government regulated effluent tests
- Economical viable system to set-up and run
- Data acquisition system and user interface is easy to collect and analyze data
- The TEWS system is a portable self-contained chamber

North-western Ontario needs TEWS technology in order to protect it's pristine environment