

# LIVING LAB - ONTARIO

## Water Quality

## **Researchers:** Patrick Handyside (Patrick.handyside@agr.gc.ca) and Sonja Fransen

#### **Research Objective:**

• Determine the impacts of best management practices on nutrient and sediment concentrations, and the partitioning of water flow between surface runoff and tile drainage



2022

#### **Parameters Measured**

- Total phosphorus (TP)
- Dissolved reactive phosphorus (DRP)
- Total suspended solids (TSS)
- Nitrate (N as NO<sub>3</sub>)
- Total Kjeldahl Nitrogen (TKN)
- pH
- Total inorganic carbon (TIC)
- Total organic carbon (TOC)



Map showing location of three fields and water sampling equipment (circles)

#### What Does This Mean for Agriculture in Ontario?

- Insight into how different crops impact water flow from the fields between surface runoff and tile drains
- Confirm the evidence that earthworm burrows from surface to tile drain is the dominant pathway for phosphorus movement
- Determine the pathways that different nutrients leaving the field (surface vs subsurface) follow and how management practices impact them
- Improved understanding of these pathways will allow for better recommendations of best management practices to limit nutrient loss



Algae growing in Wigle Creek (Source: Essex Region Conservation Authority)



One of three edge-of-field water monitoring stations at Henry Denotter's farm.





## Sampling Equipment



#### Surface water sampling equipment

- A Data logger for water level sensors
- B Solar panels to keep batteries charged
- C Trail camera to record water level
- D Wing walls to direct surface water to the flume
- E Flume for collecting surface runoff
- F Stilling well to sense water flow and trigger sample collection



Tile water sampling equipment

- A Auto-sampler for surface runoff (hose goes to flume)
- **B** Auto-sampler for tile runoff (hose goes to Agri-Drain)
- C Agri-Drain control structure to house tile water senosrs
- D Suction lines encased with insulation to allow year round sampling
- E Batteries to power samplers, modems and sensors
- F Modems to send cell phone notifications



Water samples collected in bottles from rainfall or snowmelt events every 30 minutes to 3 hours apart, depending on the season.

### **Example Results**

- Graphs showing data collected from field 1-5 for the period October 2021 to December 2021 for surface runoff (top) and tile drainage (bottom)
- Illustrates that rise in water levels (lower lines) is triggered by rainfall events (upper blue bars)



- Tile flow occurs more readily and for a longer period after rainfall than surface runoff
- Nutrient concentrations (square/triangle points) are used to calculate the mass of annual nutrient loss



#### **Key Terms**

- Surface Runoff: the flow of excess water across the surface that the soil can no longer infiltrate sufficiently
- Tile Drains: sub-surface drainage system that collects excess sub-surface water within perforated plastic pipe or clay tile and redirects it from the field