

Edge of Field Monitoring: A Flood of Information



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Research objectives

- 1. Monitor phosphorus transported via tile drains and surface runoff at the edge of farm fields**
- 2. Quantify phosphorus concentration loss under various conditions**
- 3. Evaluate the effectiveness of BMPs**
- 4. Determine the effect of agricultural management on watershed-scale as it relates to phosphorus transport**

Edge-of-field research

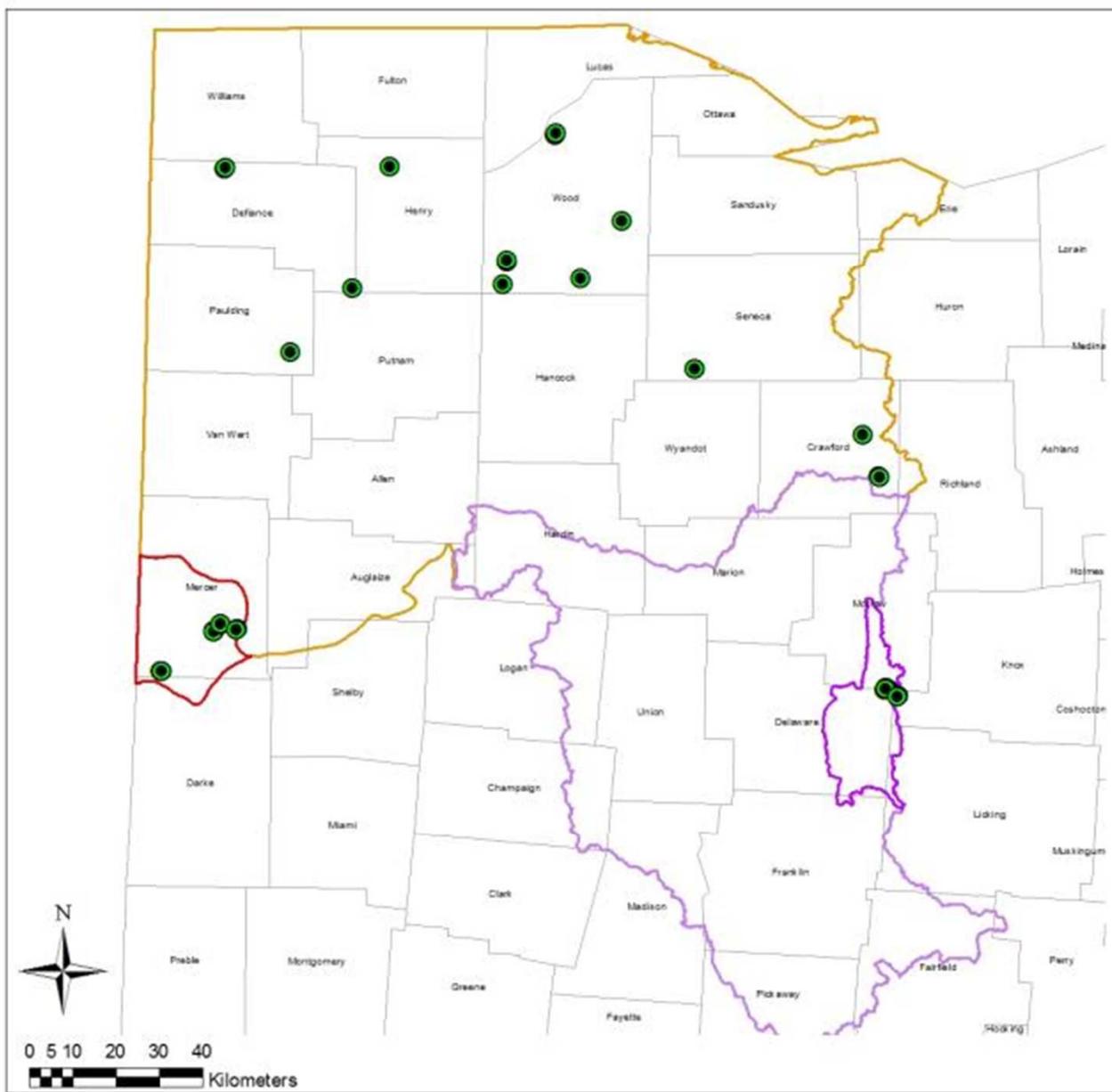
- 19 locations in a paired study (38 fields) that are representative of Ohio crop production agriculture
- Surface flow is monitored using H-flumes
- Tile discharge monitored with compound V-notch weirs



ARS EOF Sites

Legend

- Paired EOF Sites
- Upper Big Walnut Creek Watershed
- Upper Scioto River Watershed
- Upper Wabash River Watershed (Ohio)
- Western Lake Erie Basin (Ohio)



Data Collection and Analysis

- Precipitation and discharge recorded on a 10 minute interval
- Water quality measurements derived by both
 - Event and daily samples
- Analysis includes DRP, TP, NO₃-N, and TN



Site Selection Challenges

- 1) Find Cooperators willing to share records and manage sites accordingly**
- 2) Site accessibility**
- 3) Minimal 'edge effects' (E.g. buffer-strips, neighboring fields, drainage back-ups)**
- 4) Suitability for power source**

Instrumentation Equipment



- Isco 4230 Bubbler
- Isco Sampler 6712
- Isco Rain Gage Tipping Bucket



- Isco 2150 Area Velocity Sensor is deployed at tile sites

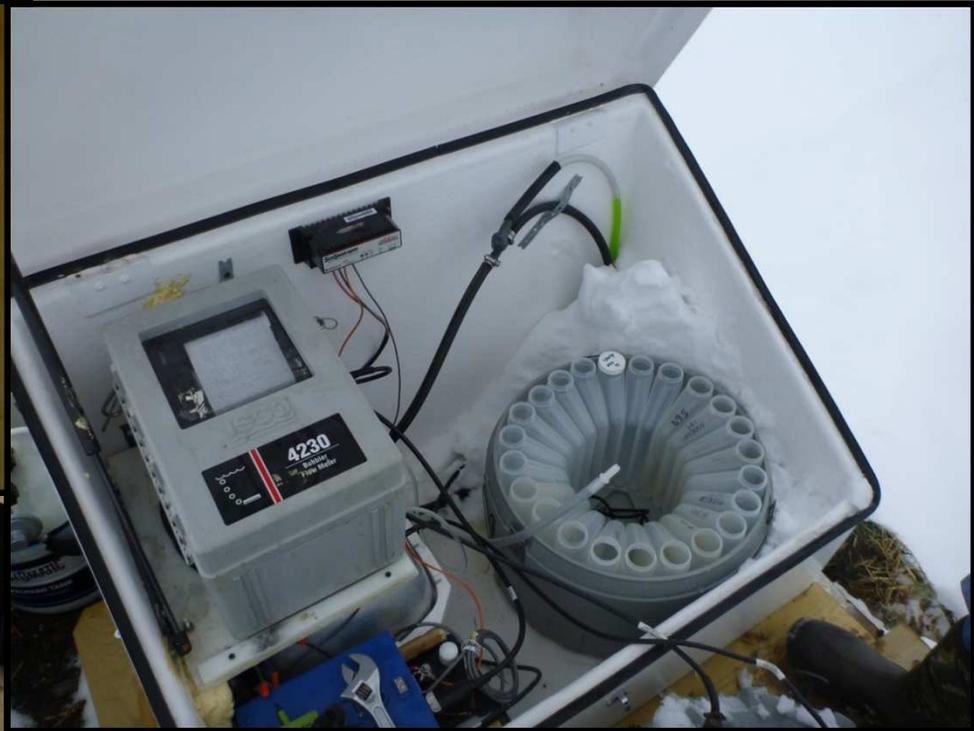
Novalynx standard rain gage

Base mount inside buried pvc pipe.



Funnel and inner cylinder are removed in winter to measure snowfall.

**8 – 2 liter bottle for runoff
24 -1 liter bottle for tile**



Collected water samples are refrigerated at our lab on OSU campus where they are cataloged and filtered prior to analysis.

Site Construction

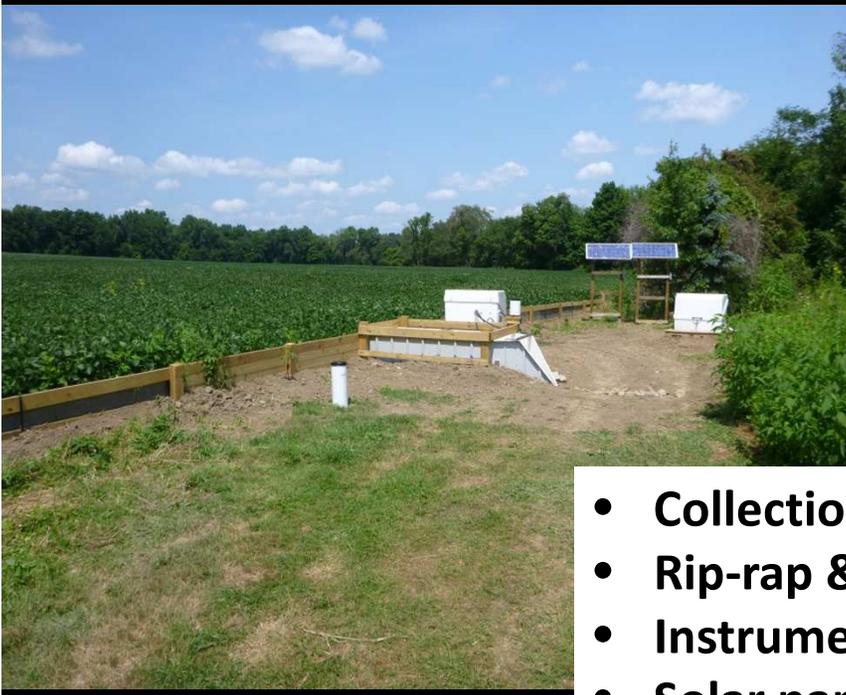


Flume Installation

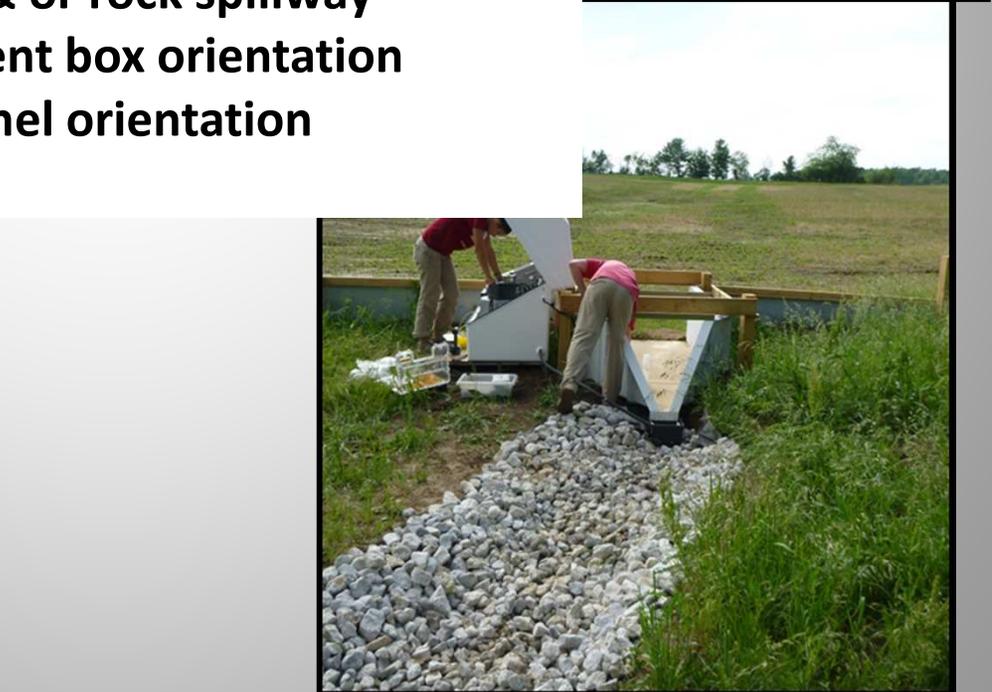
- Site excavation & grading for flow path
- Construct wood support frame to set flume
- Install wing-wall: wood and or metal materials
- Install geo-textile erosion control around entrance



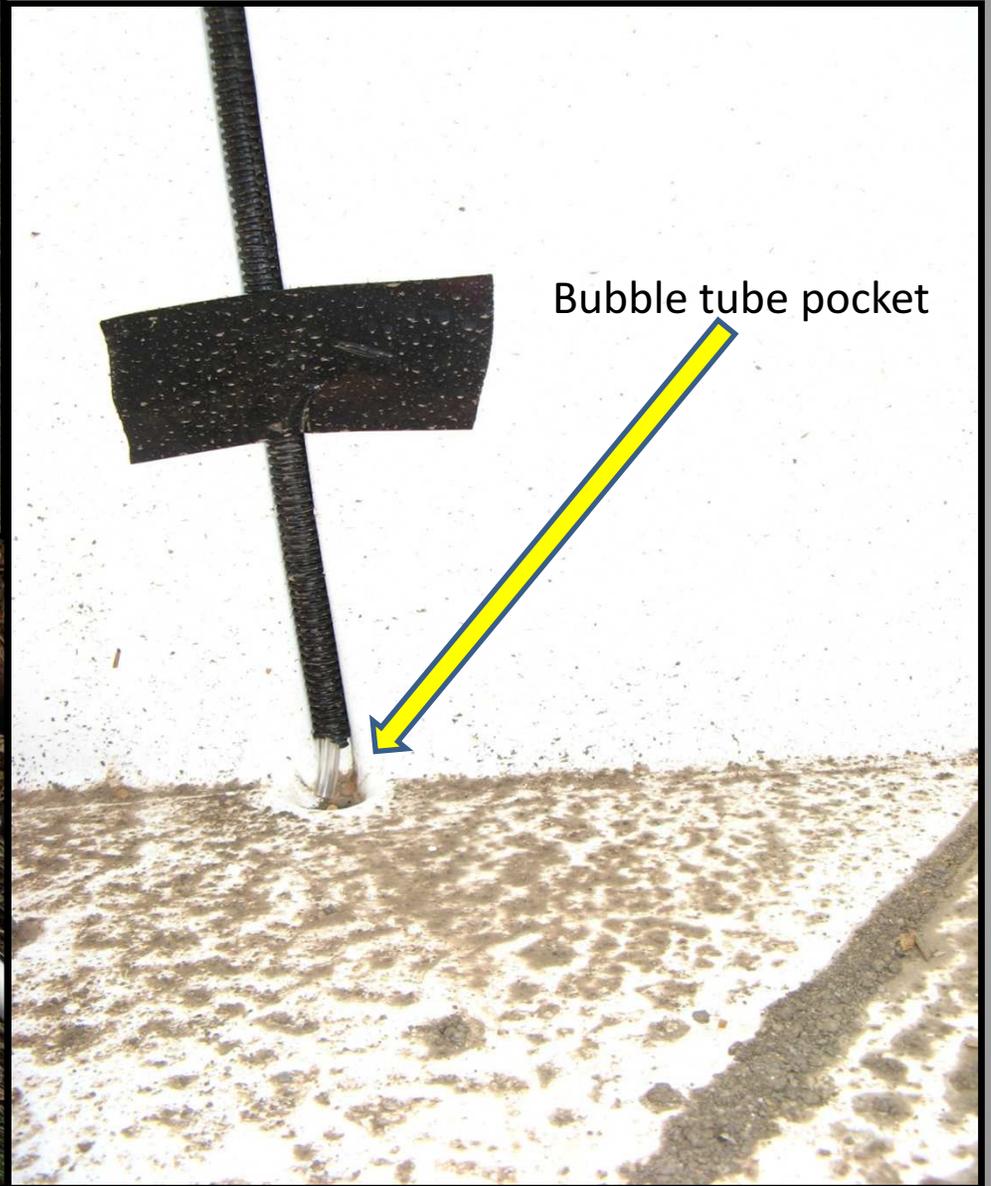
Flume Installation



- Collection point installed at throat
- Rip-rap & or rock spillway
- Instrument box orientation
- Solar panel orientation

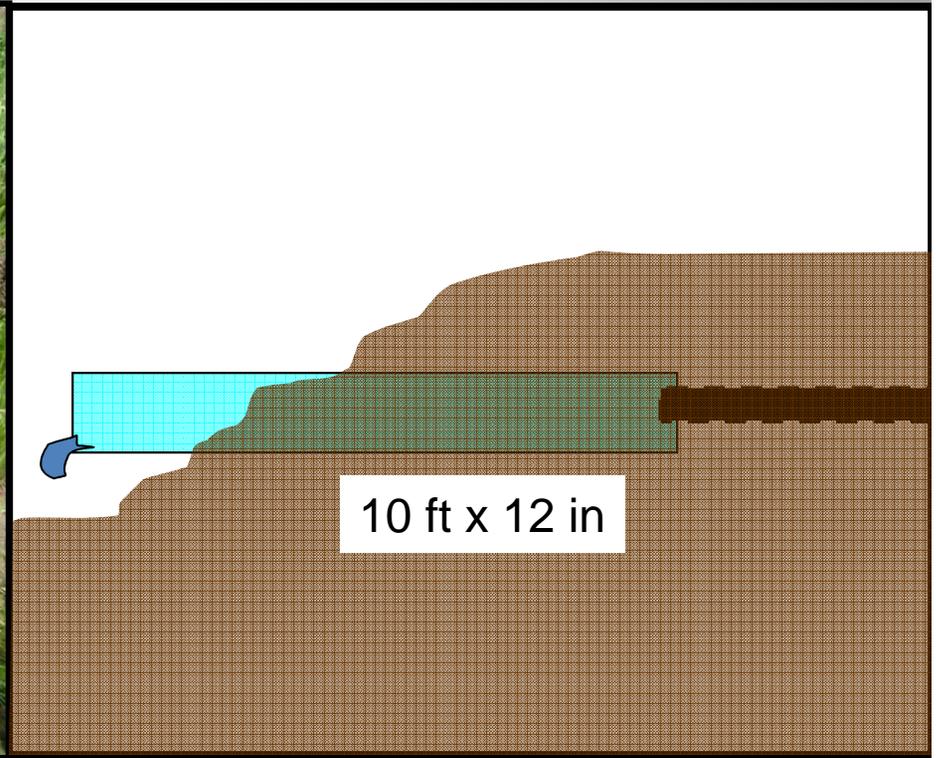


Flume features



Tile Installation

A stilling pipe is adapted to an existing outlet. Typically a reducer coupling on a 12" dia x 10' stilling pipe is fitted over an existing 8" main.





Stilling pipe is set level
(usually 12" dia. & $\geq 10'$ in length)

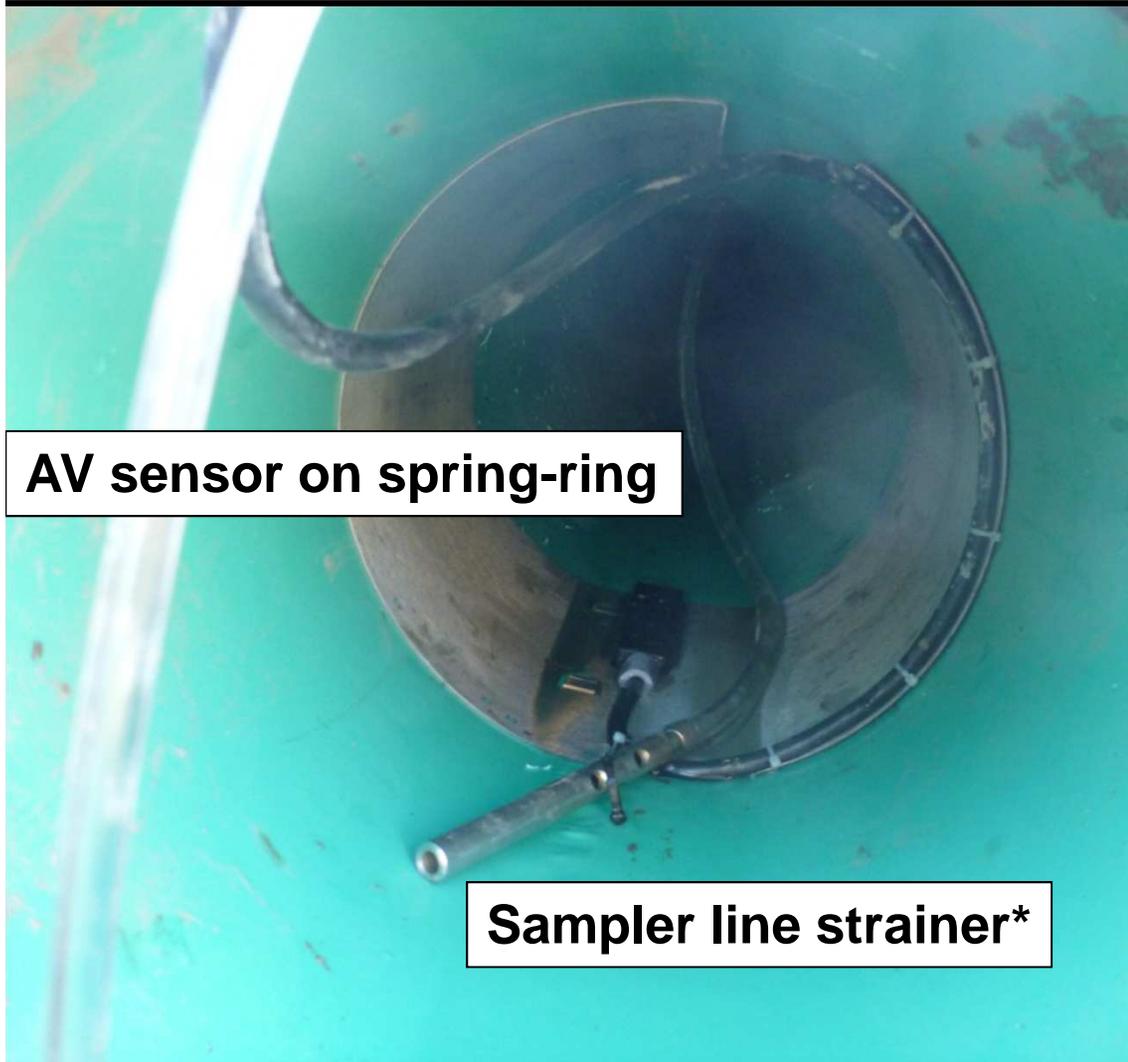
**Buried sample line in conduit pipe
back-filled with continuous slope**



**AV sensor and
bubbler line conduit**



Stilling Pipe Instrumentation

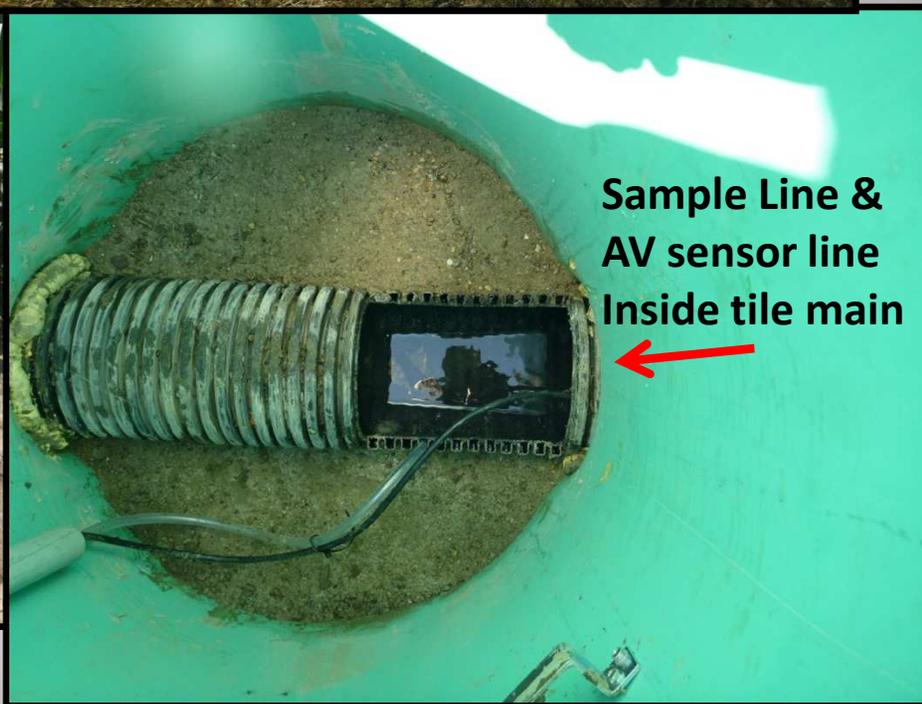


* Screen mesh needed to prevent earthworm contamination.

Sample line in Agri-Drain control structure



In-field tile monitoring without Thelmar outlet



Power Needs



A single 150 Watt Solar panel rated @ 12 V with a Genasun boost/buck technology solar controller or Morningstar MPPT Suntrack controller

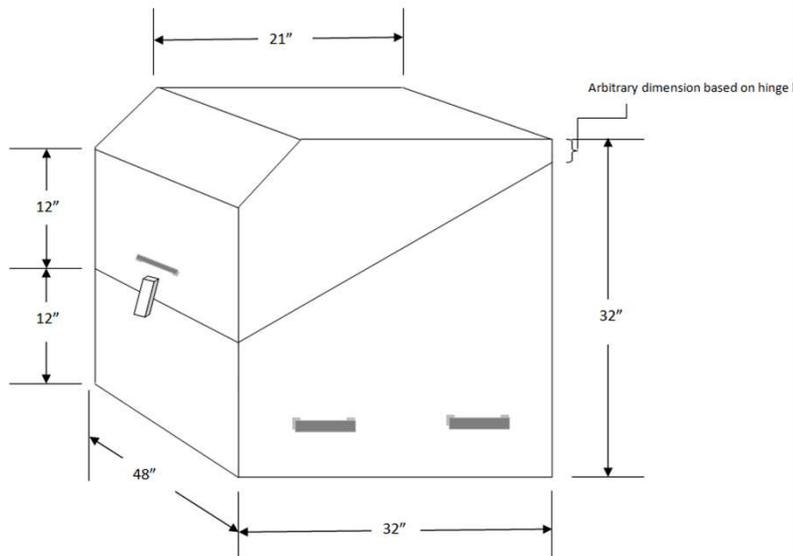


Winter Sampling



Dealing with ice and snow to prepare for the next thaw.





Insulated enclosure with propane powered RV 6 gallon hot water tank

Heater is thermostatically controlled to maintain temps between 35°F - 45°F



Deep ditch snow-pack & accessibility hazards



Adding stops to Thelmar to keep in place during frozen conditions and storm events

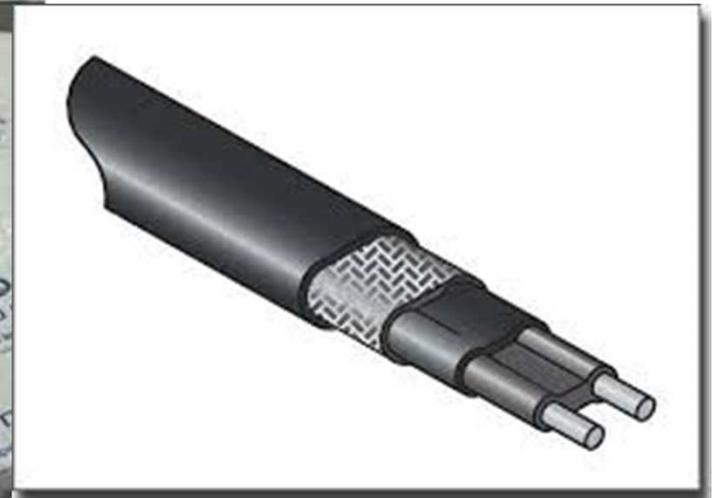
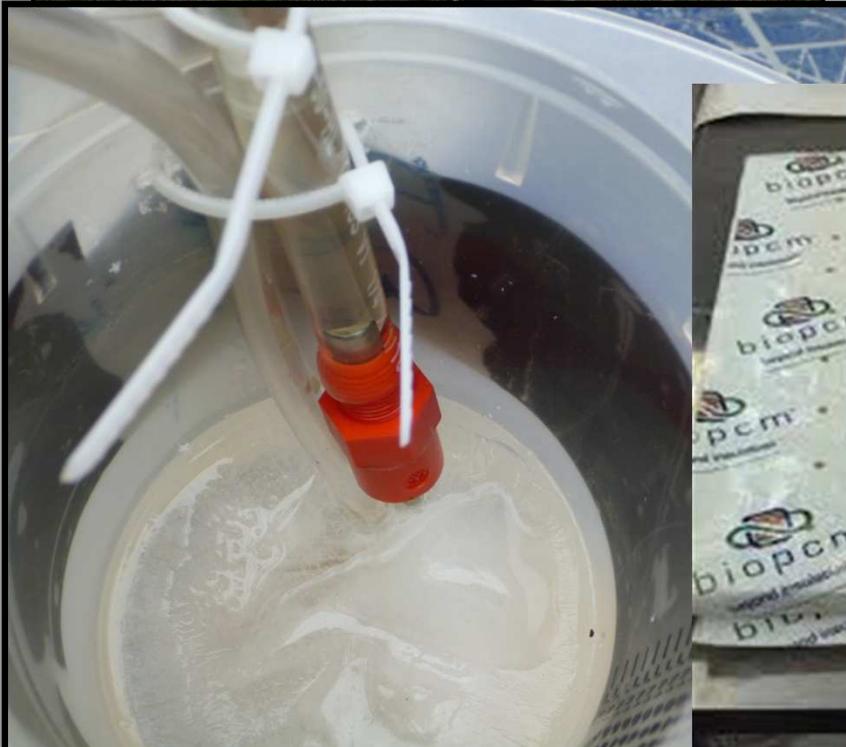


PVC flat cap modified as a Thelmar retainer

Keeping Lines from Freezing



- Line slope to sampler head
- Propylene glycol at bubbler tip
- 12 VDC @ 3.5Watt/ft Freezstop heat tape w thermostat around strainer
- Phase-Change insulation packs on pump head



Managing Severe Events



Managing Severe Events



- Seeding entrance area and cover with Nancy's Blankets
- Use of sod at entrance area in early spring
- Use of Geo-textile to help prevent under-cutting
- Plugging with soil, Benseal, Quickcrete where applicable

Acknowledgements

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**That's enough information
for goodness snakes!**

