Long-Term Monitoring of Tile Drainage in Cranberry Farms

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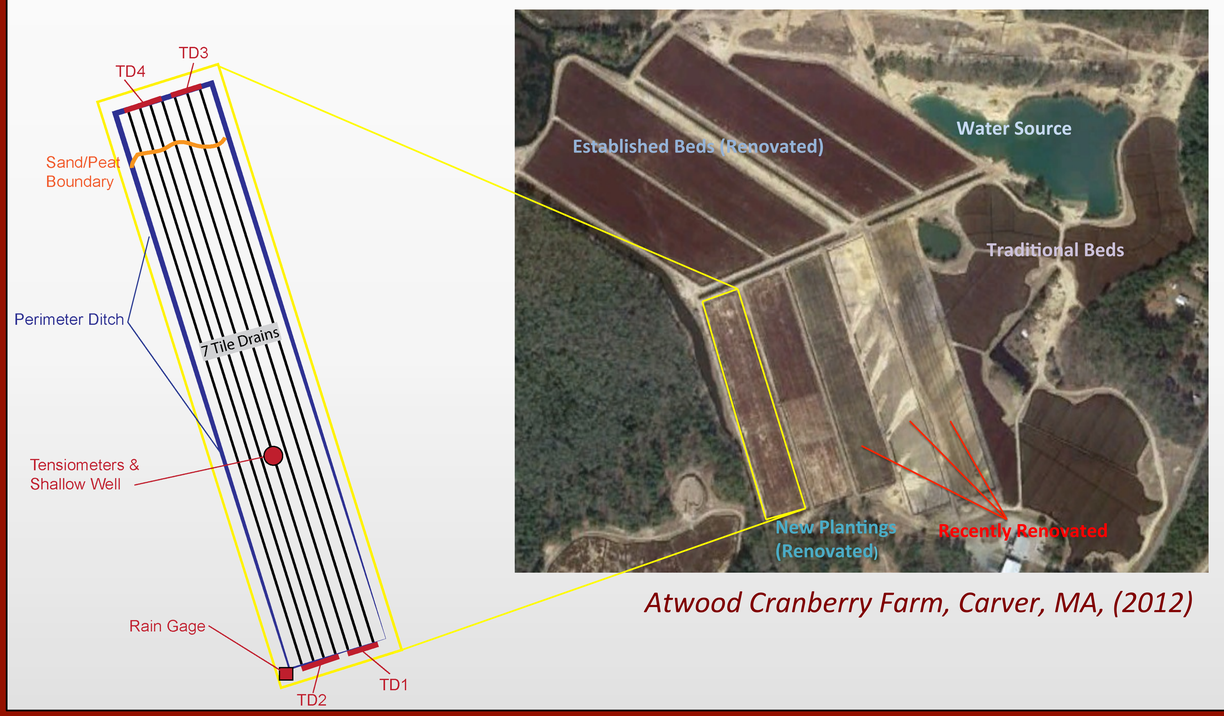
1. Objectives:

- *Hydrological:* Identify factors across scales (from pedon to landscape) controlling rapid drainage in cranberry farms.
- *Environmental:* Quantify sources, transport pathways, and attenuation of nitrogen (N) and phosphorus (P) in tile drainage, ditch water, and off-site runoff .
- *Agronomic*: Develop quantitative relationships between controlled drainage (number of tiles, spacing and depth) and indices of fruit disease (soil tension/moisture, temperature, nutrient availability, etc.).

2. Site Description:

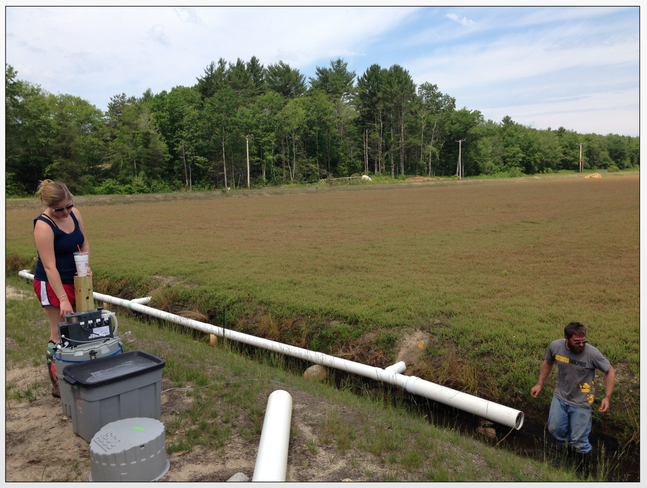
- Site is a 5-acre cranberry bed, part of an 88 acre farm in Carver, MA.
- Renovated (2010), including installation of tile drainage, squaring at ends (peat absent in north section), and new plantings (Stevens).
- Tile drainage consists of 7 lengthwise tiles (not socked), spaced at 20 ft and installed to a depth of 1 ft.



Atwood Cranberry Farm, Carver, MA, (2012)

3. Tile Flow Method and Measurement:

- Groups of 3 and 4 tiles connected with PVC pipe.
- Continuous (15-min) volumetric discharge measured at the outlet of each of the 4 tile cluster groups (TD1-TD4).
- Compound weirs and area-velocity meters used to measure discharge.
- Daily composite (6-hr) water samples collected at each tile outlet (4 total) for analysis of nutrients (N and P).

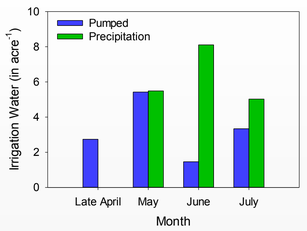


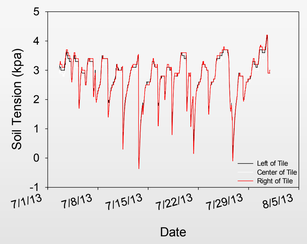
Three tile cluster on the south end (TD1).

Discharge measurement at TD1.

4. Hydrological Monitoring:

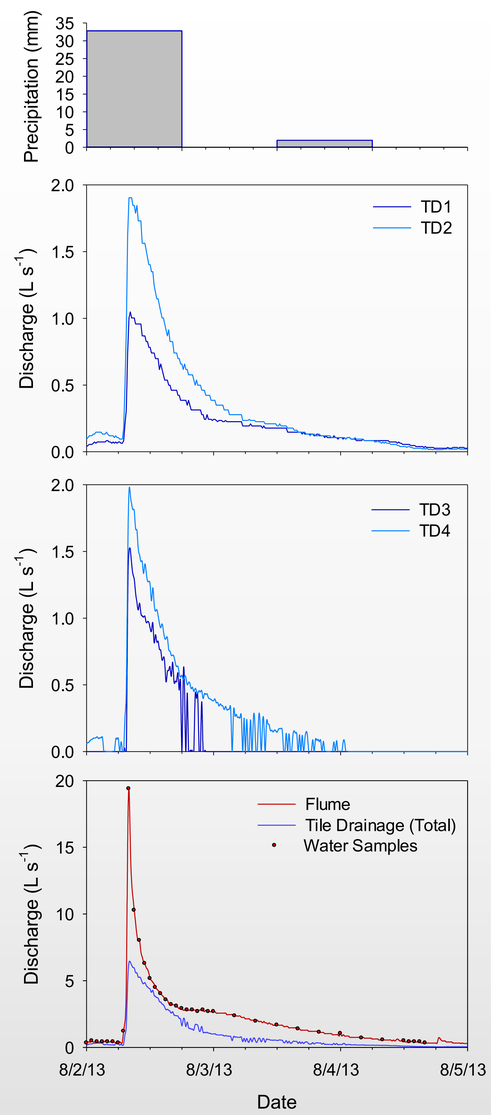
- Irrigation water: Propeller flow meter installed on irrigation pump.
- Off-site runoff: Weir installed on flume draining bed.
- Soil tension: Soil tensiometers installed in bed center.
- Groundwater level: Shallow well and pressure transducer installed in bed center.
- Water sampling: Daily to weekly sampling of water inputs and outputs.





5. Storm Event Response:

- Tile and flume discharge monitored following a 3.2 cm (1.25 in) rain event.
- Similar hydrograph rising limb among tile and flume sites; more prolonged falling limb in tile sites.
- Discharge from TD3 and TD4 ceased at 18:00 on 8/2/13, coinciding with submergence of the tiles.
- Integrated water inputs lower for the 3-tile groups (57 m^3, TD1; 35 m^3, TD3) than for those including 4 tiles (86 m^3, TD2; 67 m^3, TD4).
- Total discharge from tiles equaled 244 m^3, about half the discharge exiting the flume (516 m^3), and 1/3 of the rain deposited on the cranberry bed (745 m^3).
- Water samples will be analyzed to quantify N and P loss from the bed and attenuation in ditches



6. Acknowledgements: Funding from NESARE grant and technical support from Cassandra Rogers.