ISCO storm sampling and calibration

Locations:

ISCOs (model 6712, manufactured by Teledyne) are deployed in 12 streams throughout Macon County. These are the sites in which the Hach Hydrolabs also reside. Nine of these sites correspond to streams chosen for intensive surveys for the Exurbanization project. Three other sites are located at USGS gauging stations on Cartoogehaye Creek and the Little Tennessee River. Most of the machines are housed in wooden or plastic/metal shelters.

Function:

These samplers are set to take stream water during large, county-wide rain events. To that end, LTER field techs travel to each site and manually initiate the program to begin sampling at the time of a storm’s projected arrival. Twenty-four 1-liter bottles are filled during storm events.

Two pieces of aquatic equipment occupy the water—sample intake tube with strainer and a pressure transducer for depth measurements. These are attached to rebar. The transducer is usually on the streambed attached via a clamp. The strainer is positioned in the middle of the water column and is attached via zip tie.

Maintenance Materials:

- Waders
- 12V batteries
- 581 Rapid Transfer Device
- Zip ties
- Clamps
- Latex gloves if water is cold
- Keys
- Disinfectant
- Wasp killer
- Ruler/meter stick

Storm “Chasing” Materials:

- Maintenance materials
- Sample bottles
- Bottle containers
- Sharpie
- Rain gear
Maintenance:

To ensure storm readiness, ISCOs are checked for rainstorm damage and aquatic debris on a weekly basis. Typical maintenance includes removal of leaves, twigs, branches, and excess sediment that collect around the aquatic equipment. Rainstorm damage repair may include the retrieval of aquatic equipment from downstream, and the replacement of rebar, clamps, and/or zip ties. Rocks may need to be replaced over the tubes and cables. Recalibrate transducer if necessary.

At some sites, the ISCOs and shelters need to be monitored for mouse invasions and possible chewing damage to tubes and wires. Disinfecting spray and gloves are recommended.

Batteries are changed every other week. During this time, data recorded by the ISCO pertaining to depth are downloaded onto the 581 Rapid Transfer Device (RTD). The RTD has several LED’s that light up when connected to an ISCO—a Data Transfer light, Power Light, and Error/Memory Full light. While the data are downloading, the Data Transfer light will blink. Download is complete when that light stays solid.

Storm “Chasing”:

Weather conditions are monitored for oncoming storms and rain events that will affect the entire county. The website for NOAA (www.noaa.gov) typically indicates the estimated time of a storm’s arrival, which is then used to set the sampling program for the ISCOs. However, at Needmore and Prentiss, the samplers begin collecting water 4 hours and 2 hours later, respectively, as the Little Tennessee River responds to rain more slowly. The sampling time is set by modifying the “Clock Delay” step in the program.

Remove debris from around aquatic equipment if necessary, and replace the batteries.

The current program runs for 27 hours. This may require the retrieval of bottles over the course of two days. Fresh bottles are labeled for their respective ISCOs and used to replace filled sample bottles.

Troubleshooting of Common Problems:

Distributor Arm Jam is a common occurrence during sample events. Fortunately, it can usually be resolved, but often causes flooding of the ISCO tubs. Drain tubs if applicable, check distributor arm tube in case it is snagging sample bottles, and adjust tube if needed. Stop the running program and follow these Menu steps:

[Menu→Other Functions→Manual Functions→Move Distributor Arm]

You can then choose where the arm needs to move. I recommend choosing bottle 1, followed by bottle 24, and then return it to bottle 1. This should resolve the jam. The program will require a complete restart. If it remains unresolved, the ISCO may require service by its manufacturer.

Power Failure is often due to loose wires or dead battery.

Random Stop to Program - The program may resume upon restart of the ISCO. However, the entire program may need to be restarted if the current program won’t continue.

Overfilled Bottles - The ISCO will require volume recalibration. When a program is running,
calibration cannot occur. Let the program continue and repair at a later date. When you are able to calibrate (you will need a graduated cylinder), the Menu steps are:

[Menu ⇒ Other Functions ⇒ Manual Functions ⇒ Calibrate Volume ⇒ Standard Portable ⇒ Sample Volume (choose the amount delivered to the graduated cylinder) ⇒ Calibrate Volume]

Remove pump tube from the bulkhead fitting and fill the graduated cylinder with the sample

[Volume delivered (enter the amount pumped into the graduated cylinder in mL) = “are you sure? Yes/No”]

Intake Tube may be dislodged from rebar. If found on the bank, place strainer back into stream and attempt to secure it.

Transducer may also be dislodged from rebar. If you’re able, reclamp to rebar; otherwise wait to repair later. Recalibrate the depth.

Take a grab sample if you encounter a mechanical problem that can’t be resolved. Remove pump tube from bulkhead fitting, and follow Menu steps:

[Menu⇒Other Functions⇒Manual Functions⇒Grab Sample⇒Sample Volume⇒Enter When Ready]

**Current Program**

Extended Program

Program Name: Storm

Site: Stream Name

Units for Length: ft

Mode of Operation: Level Only

Current Level: _____

Data Storage Interval: 15 mins

Number of Bottles: 24

Bottle Volume: 1000mL

Suction Line Length: _____

Auto Suction Head

Rinse Cycle: 1

Retry: 1

Two-Part Program

Part A: Bottles 1-12
Uniform Time Paced
Time Between Sample Events: 45 mins
Distribution: Sequential
Volume: 1000mL
Enable: None Programmed;
   Once Enabled, Stay Enabled
   Sample at Enable
Pauses and Resumes: 0
Part B: Bottles 13-24
Uniform Time Paced
Time Between Sample Events: 1hr 30 mins
Distribution: Sequential
Volume: 1000mL
Enable: When ‘A’ is Done
   Once Enabled, Stay Enabled
   No Sample at Enable
Delay to Start of B: 0
Pauses and Resumes: 0
Clock Delay to “Storm”