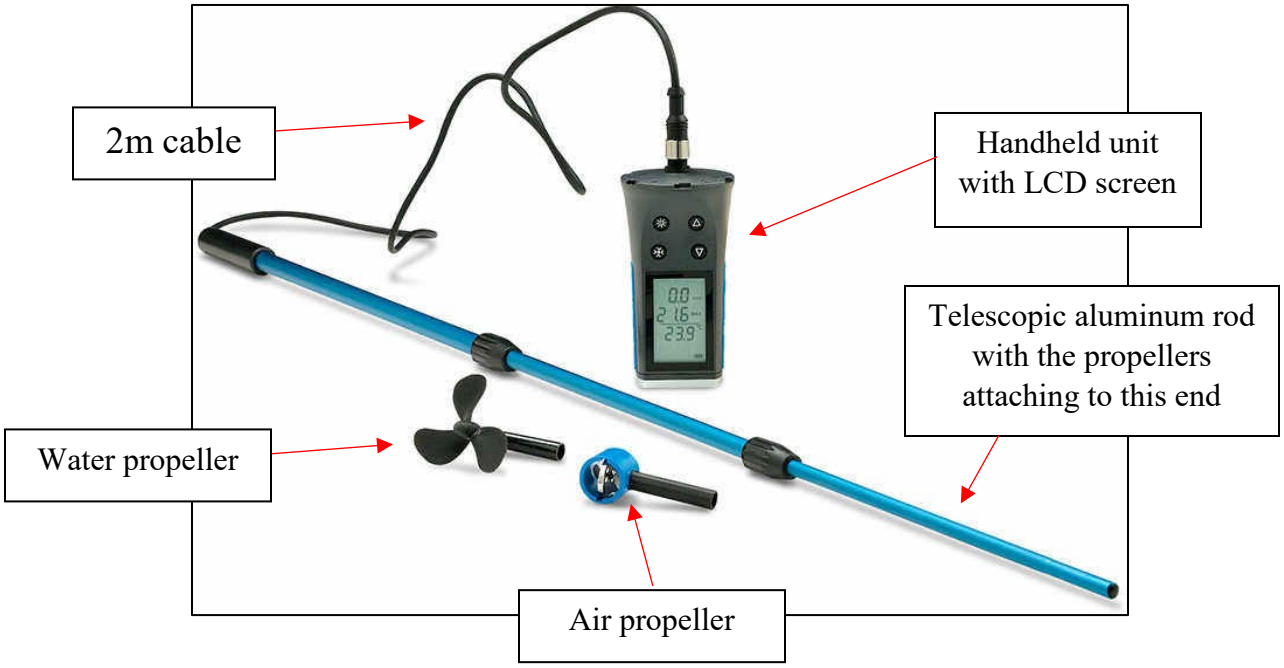
FloWatch Swissmade: Flow Meter Instructions

For Lancaster County WQVC Volunteers

The Flow Meter

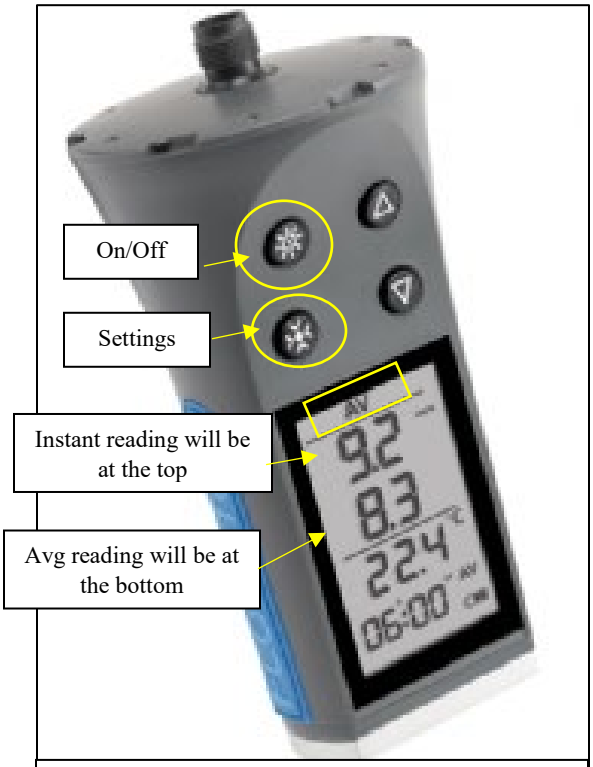
The most popular handheld flow meter on the market. It measures water and air speed as well as temperature with high accuracy thanks to its high-quality Swiss sensors. The propellers will only fit onto the inner most aluminum rod, so you may need to loosen the outer rods until the inner one is able to be extended.



Location of flow meters in Farm & Home Center

The flow meters will be kept in black cases with a carrying strap in the locked metal cabinet located in the first-floor lunch room of the Farm & Home Center. Each case is tagged with a flow meter ID to be recorded on data and equipment sign-out sheets.

The Handheld Unit: What do the numbers mean?



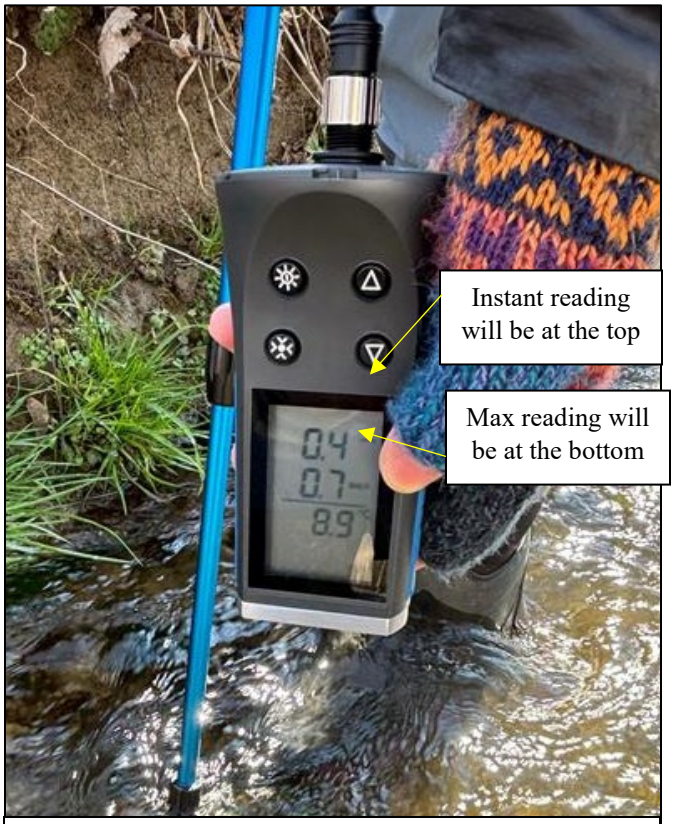
*Handheld Unit with **Average** Reading Mode*

The handheld unit can be turned on by holding the "sun" button down. This is the on/off button.

Velocity units should be recorded in m/s and if the unit is not displaying m/s, press the "circle" button slowly twice to get the flashing line selecting the top number. Toggle through the unit options with the arrows until m/s is displayed and then hold down the "circle" button to save the setting. Follow these steps to change modes, but it will be the first line that should change, not the second.

You can reset the memory of the unit by pressing the "circle" button and the down arrow together.

There are different modes for measurement with the unit - instantaneous and average measurements. Instantaneous readings will always appear at the top of the unit. If on Average mode, the average velocity will be displayed in the center. If using Instantaneous mode, the maximum velocity measured will be displayed at the center instead. **Readings should be taken in instantaneous mode.** Follow the steps above to change settings. We highly recommend keeping the unit on this mode. For a quick mode identification, the very top of the screen will not have any letters when in instantaneous mode.

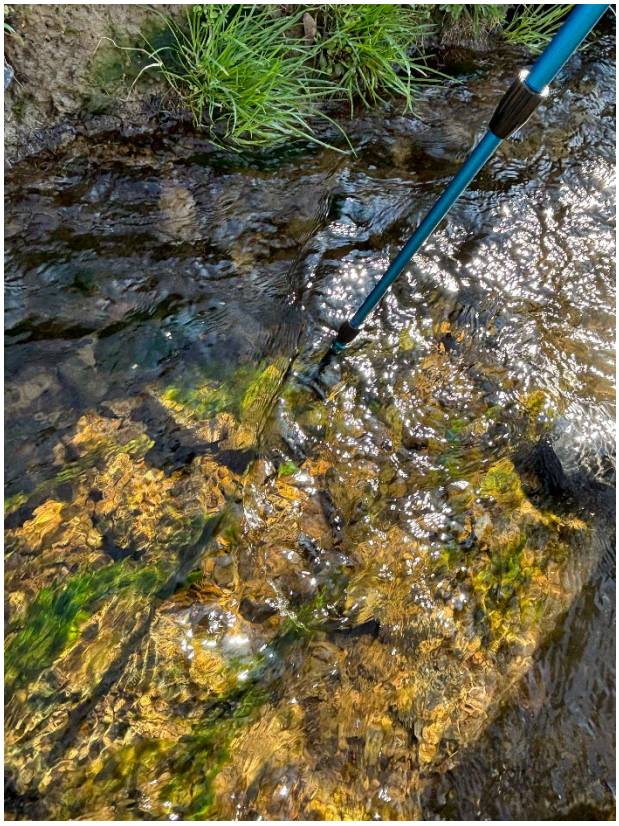


*Handheld Unit with **Instantaneous** Reading Mode*

Recommended Sampling Workflow for measuring Stream Flow

Continue as usual mapping out a 10m section of the stream and taking 5 depth and width measurements (in meters) along that section. At each of those measurement points, put the constructed flow meter (with water propeller attached) into the stream. The propeller should not be too low in the water column and should be at in the fasted part of the stream at your measurement point. Record the instant velocity readings at the 5 sampling points to calculate the average stream velocity.

*Be careful not to get the water propeller caught in algae or any other debris as it will result in inaccurate readings and will increase the risk of entanglement.



Calculating Stream Flow

With the average depth, width, and velocity measurements, you will be able to calculate stream flow (m^3/s). The flow calculation document is attached at the end of these instructions but is also on our website and in the WQVC drawers.

*Depth * Width * Velocity = Flow*

Logistics:

Below is an image of how the flow meters should be put back into the case. Please take care to not damage the unit and to clean out any debris that may be stuck. In addition, please reset the memory after or before use to only be using your sampling measurements. There is a battery status indicated on the display – if unit is dead or dying, let Amanda or Noelle know and they will replace the batteries. Please turn units off when finished sampling.

Questions/Concerns:

For any questions, concerns, or suggestions, please contact Amanda Goldsmith or Noelle Cudney.

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Water Monitoring Field Data Sheet *(p 5 of 12)*

Stream Flow Volume or Discharge Check to see if the United States Geological Survey (USGS) has the information for Stream Flow Volume or Discharge for your site. Check this Internet address:

water.usgs.gov/
"USGS Water Resources of the United States"
Look under "Water Data"; "Real-time"

If stream discharge data is available for your site, you can use this information rather than performing the procedures on the following pages (stream width, depth, and velocity). Make sure to check for this information BEFORE you go out to the stream site.

If the USGS does not have this information for your site, make sure to do all of the physical assessments and all of the math to save yourself or your SEC's designated Web Host time.

Stream Width Determine the average width of wadeable streams by measuring at 5 places within your sampling area and dividing the total by 5. For the purpose of converting feet to meters use: feet x 0.3048 = meters.

_____ + _____	+ _____	+ _____	+ _____	+ _____	= _____	÷ 5 = _____
meters	*meters*	*meters*	*meters*	*meters*	*meters*	*meters*
Sample 1	*Sample 2*	*Sample 3*	*Sample 4*	*Sample 5*	*Total*	*Average Width*

____ Non-wadeable Stream
For non-wadeable streams, if you have recorded stream width, note WHAT you have done below.
Notes: _____
_____
_____

Stream Depth Determine the average depth for wadeable streams by measuring at 5 equal intervals along the width of the stream and dividing the total by 5. For the purpose of converting use: inches x 2.54 =centimeters centimeters ÷ 100 = meters.

_____ + _____	+ _____	+ _____	+ _____	+ _____	= _____	÷ 5 = _____
meters	*meters*	*meters*	*meters*	*meters*	*meters*	*meters*
Sample 1	*Sample 2*	*Sample 3*	*Sample 4*	*Sample 5*	*Total*	*Average Depth*

____ Non-wadeable Stream
For non-wadeable streams, if you have recorded stream depth, note WHAT you have done below.
Notes: _____
_____
_____

Date _____/_____/_____
Site ID # _____

Water Monitoring Field Data Sheet *(p 6 of 12)*

Surface Velocity

Complete the following steps to determine the surface velocity of wadeable streams:

1. Measure and mark a 10 meter distance at your stream site, using the depth management line as the up stream mark. Each of the 5 intervals marked off to measure stream depth should be used as starting points for the weighted bobber.

2. Release the bobber at each of the 5 intervals, and time how long it takes the bobber to travel from the upstream mark down 10 meters to the downstream mark.

3. Divide the 10 meter distance by the travel time of the bobber to determine the stream's surface velocity.

4. Run the test 5 times, once at each of the 5 intervals you used for measuring depth along the transect, and take the average.

Trial #1: _____ meters ÷ _____ time (seconds) = _____ meters per second

Trial #2: _____ meters ÷ _____ time (seconds) = _____ meters per second

Trial #3: _____ meters ÷ _____ time (seconds) = _____ meters per second

Trial #4: _____ meters ÷ _____ time (seconds) = _____ meters per second

Trial #5: _____ meters ÷ _____ time (seconds) = _____ meters per second

Total = _____ ÷ 5 = _____ meters per second

Average Velocity

_____ Non-wadeable stream

For non-wadeable streams, if you have recorded surface velocity, note WHAT you have done below.

Notes: _____

_____

_____

Date _____/_____/_____

Site ID # _____

Water Monitoring Field Data Sheet *(p 7 of 12)*

Stream Flow Volume or Discharge
Calculate the streamflow volume (cubic meters/second - cms) using the above measurements.
Check here if stream discharge data was obtained from the USGS. ____
Enter this data below as the Stream Flow Volume in cubic meters/second.
(You will need to convert cubic feet/second to cubic meters/second.)
For the purpose of converting cfs (cubic feet/second) to cms use: cfs x 0.0283 = cms

w x d x v x k = cms

_____	X	_____	X	_____	X	_____	= _____ cms
Avg. Width (meters)		Avg. Depth / (meters)		Avg. Velocity / (meters sec.)		k * / (stream bottom constant)	Streamflow Volume

*k = stream bottom constant (0.8 if it's rubble/gravel or 0.9 if it is sand, mud, silt or bedrock)

Ice Coverage, if any (refer to page 46) _____%

Snow Depth, if any _____inches

Wildlife seen (alive or dead) or heard – Please identify species (see Extras Appendix) when possible, and/or take a photo when able.

_____
_____
_____
_____

Seasonal Changes Observed

_____
_____
_____

Weather Notes (example: our county is under a drought watch, tornados touched down in area earlier this week)

_____
_____
_____
_____

Date _____/_____/_____ **Site ID #** _____