

## HOW-TO USE DIFFERENT TYPES OF THERMOMETERS

### Bulb Thermometers

Bulb thermometers come in all kinds, lengths, and shapes, and are usually made of glass (although some thermometers are made of plastic). Many glass thermometers are sold with an “armor” made of a perforated metal or plastic sheath, to protect the delicate glass.

*For this event, please use a thermometer with a range of at least (60-80 °F) and take measurements at least 1 foot from the bank.*

**Step 1:** To measure temperature of water with a bulb thermometer, immerse the thermometer in the water.

**Step 2:** Allow a minute or so for equilibration, then read while still immersed in the water.

**Step 3:** Report data by filling out this Google form: <https://goo.gl/forms/RJ6c9RunbH6uVDKY2>

### Minimum-Maximum Thermometers

Min-Max thermometers can be used in water or air. They can be deployed over a desired period of time to obtain records of the minimum and the maximum that had occurred during that deployment period, without having to be present.

*For this event, please use a thermometer with a range of at least (60-80 °F) and take measurements at least 1 foot from the bank.*

**Step 1:** Inspect the device before use, to ensure that there are no air bubbles in the continuum of mercury in the U-shaped tube.

**Step 2:** To reset the thermometer, hold it upright and press the central ridge toward the back – this will push the magnet (that holds the stoppers in place) backwards and release the stoppers. Wait until both stoppers slide down and reach the tops of the mercury columns.

**Step 3:** Deploy the device for the desired period of time at the desired location. Make efforts to deploy in an upright position. Note that the entire device has to be in the ambience of the environment you are recording: it does not have a sensitive point like bulb thermometers or thermistor probes.

**Step 4:** Retrieve the thermometer and read the temperature scales at the following places: • Current temperature – where the mercury levels are at the time of retrieval (they should be identical on both arms; note that the scale on the left arm is upside-down) • Minimum temperature – where the bottom of the left-arm stopper is upon retrieval (note that the scale is upside-down) • Maximum temperature - where the bottom of the right-arm stopper is upon retrieval.

**Step 5:** Report data by filling out this Google form: <https://goo.gl/forms/RJ6c9RunbH6uVDKY2>

## Monitoring Tips

The operator of an environmental bulb thermometer, when measuring water temperature, **MUST** read the temperature while the bulb is still in water! The same requirement applies to thermistor probes. This can be made easier by taking some of the creek water into a cup, keeping the thermometer in it and bringing it to eye level for rapid reading.

Whether you are using a bulb thermometer or a Minimum-Maximum thermometer, remember:

- never shake the thermometer upside down
- always keep flat or upright, never upside down
- avoid exposure to extreme heat

## Thermistor Thermometer

Thermistors commonly are incorporated in instruments used for surface water and ground water measurements such as a dissolved oxygen meter. A benefit of using a thermistor thermometer is the flexibility of where the probe can be placed within a waterbody in respect to the operator's location.

*For this event, please use a thermometer with a range of at least (60-80 °F) and take measurements at least 1 foot from the bank.*

To measure the temperature of surface water:

Measure temperature in sections of the stream that represent most of the water flowing in a reach. Do not make temperature measurements in or directly below stream sections with turbulent flow or from the stream bank.

Immerse the sensor in the water to the correct depth and hold it there for no less than 60 seconds until the sensor equilibrates thermally. The sensor must be immersed properly while reading the temperature; this might require attaching the thermistor to a weighted cable.

Monitoring Tips:

- Erratic thermistor thermometer readings often result from a bad or dirty connection at meter or sensor. Tightening or cleaning the connections can correct this. If a break in the cables is found, replace the cables. If the thermistor thermometer is slow to stabilize the sensor is probably dirty or covered with oil film.
- Before going into the field check the voltage of the batteries. It is best to use good batteries in instruments and carry spares.