

**TOP:006.5**

January 31, 2018

U.S. Fish and Wildlife Service  
Marquette Biological Station  
3090 Wright Street  
Marquette, Michigan 49855  
U.S.A.

and

U.S. Fish and Wildlife Service  
Ludington Biological Station  
229 South Jebavy Drive  
Ludington, Michigan 49431  
U.S.A.

and

Fisheries and Oceans Canada  
Sea Lamprey Control Centre  
1219 Queen Street East  
Sault Ste. Marie, Ontario P6A 2E5  
Canada

**TECHNICAL OPERATING PROCEDURE**

**PROCEDURE TITLE:**

Procedures for Measurement of pH in Stream Water

**APPLICABILITY:**

Procedures apply to all measurements of pH conducted during stream treatments or toxicity tests.

**PRINCIPLE:**

Standard procedures for the measurement of pH in water.

**SAMPLE COLLECTION AND PRESERVATION:**

Portable meters:

Samples are collected by hand and measurements of pH are conducted on-site. Samples are not preserved, and samples are not transported before measurement if at all possible. Collection of water from a stream can be made with a metal bucket, but the sample is transferred to a plastic bottle before measurement.

Bench top meters:

Water samples are collected by hand and transported in a plastic bottle to the laboratory.

**EQUIPMENT REQUIRED:**

pH meter

**POTENTIAL INTERFERENCES:**

Do not measure the pH of stream water samples in a metal sample collection device.  
Avoid conditions which may allow condensation and may interfere with instrument function.  
Avoid freezing temperatures.

**SAFETY:**

Standard laboratory safety procedures are followed when handling buffers. No specialized safety procedures are required.

**DISPOSAL:**

There are no special requirements for the disposal of buffers or water samples.

**REAGENTS:**

Reagents necessary for calibration of pH meters are buffers of pH 4.0, 7.0, and 10.0 (check expiration date).

**PROCEDURES:**

Definition: pH is the measure of the free hydrogen ion activity of a solution.

**I. Calibration of the pH meter**

- A. Calibration procedures are found in IOP:007.xA, IOP:007.xB, IOP:007.xC, IOP:007.xE, IOP:007.xF, IOP:008.xA, and IOP:008.xB. Procedures are followed closely due to the importance of pH measurements in determining treatment concentrations of lampricides. All equipment failures are corrected immediately.
- B. Pour samples of buffer solutions into 50 mL beakers if conducting measurements in the laboratory. Dispense the buffers into small Nalgene bottles if making field measurements. Use buffers appropriate for the measurements to be made. Use pH 4.0 and 7.0 buffers when using pH to determine the endpoint of an alkalinity titration. Use pH 7.0 and 10.0 buffers when conducting most field pH measurements (if stream pH is less than 7.0, use 4.0 and 7.0 buffers). Buffers must be changed daily to avoid degradation.
- C. The pHs of measured standards are recorded in the instrument log book.

**II. Measurement of pH**

- A. Measurements of pH in toxicity test solutions
  - 1. Rinse the combination electrode and temperature compensating probe in deionized water, pat dry with a tissue, and immerse about 2 inches into a test solution. Stir during measurement. Allow sufficient time (minimum of 5 minutes) for stabilization before completing the measurement (until consistent readings are attained).
  - 2. The pH indicated on the display will change slowly until or stabilization is attained. Continue stirring the probes, and wait for the display to lock or the reading has stabilized. Repeat this procedure until confident that the indicated pH has stabilized.

B. Measurement of pH in a stream

1. Stream water pH is measured during treatment at a minimum interval of four hours; higher frequency is desirable. Measurements are conducted, at minimum, at all application sites and selected sampling sites. Measurements are also completed at sites that have historically exhibited pH fluctuations.
2. Measurements of pH ideally are conducted at stream side because pH measurements are unreliable in samples which have been stored or transported for a significant length of time. Stream current affects pH measurements, so it is best to collect a water sample and measure the pH in a clean plastic sample bottle. Stream water does not possess the high ionic strength of buffered standards, so the meter will not lock at a value with the speed shown during standardization. Allow sufficient time for stabilization (minimum five minutes and until consistent readings are attained).
3. Immerse the probes about two inches into the water sample while stirring. Continue the measurement until confident that the indicated pH has stabilized.

C. Measurement in a mobile laboratory

1. Water samples are collected in clean plastic bottles which are filled completely (no air trapped under the lid).
2. Samples are processed immediately (preferably less than one hour) to minimize changes in pH.
3. Water samples are sub-sampled (100 mL) and poured into a glass beaker for measurement. Probes are immersed about 2 inches into the water sample and slowly stirred.
4. Sufficient time is allowed for stabilization before recording the reading.

D. Accuracy checks

1. The benchtop meter is used to conduct checks for accuracy of meters.
2. The benchtop meter is used to resolve questions of whether a meter, the application of the method of measurement, or the sample site is the source of questionable data.

III. Documentation

A. Standardization of the meter is documented in the instrument log book each day.

1. An entry is made each morning that the meter is used. The entry includes date, time, stream, and pH and temperature of the standards used.
2. The function of the meter is again checked at the end of the day. The pH of each standard is measured and recorded in the instrument log book.

B. The pH and temperature of each water sample is recorded on the Water Chemistry data form.

**REFERENCES:**

Instrument Operating Manuals

---

This procedure has been reviewed and approved by the undersigned representatives of the U.S. Fish and Wildlife Service and Fisheries and Oceans Canada.

REVIEWED/APPROVED \_\_\_\_\_ DATE \_\_\_\_\_  
Field Supervisor (U.S.)

REVIEWED/APPROVED \_\_\_\_\_ DATE \_\_\_\_\_  
Division Manager (Canada)