



**MISSOURI STREAM TEAM
VOLUNTEER WATER QUALITY MONITORING PROGRAM
Standard Operating Procedure**

ORIGINAL EFFECTIVE DATE: September 1, 2022

RECERTIFICATION DATE:

SOP TITLE: MoST-VWQM-SOP: Nitrate Measurement in Streams Using the Zinc Reduction Method

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APPLICABILITY:

Applies to all Level 1, Level 2, Level 3 and CSI trained Missouri Stream Team, Volunteer Water Quality Monitoring Program Participants

1.0 SCOPE AND APPLICABILITY

This Standard Operating Procedure (SOP) provides MoST, VWQM Program participants with guidance on the operation of the LaMotte nitrate tablet test kit, using the zinc reduction method, to conduct field analysis of nitrate in streams. Nitrogen is an essential plant nutrient required by all living plants and animals for building protein. All organic (living) matter contains nitrogen. In aquatic ecosystems, nitrogen is present in different forms. The usable forms of nitrogen for aquatic plant growth are ammonia (NH_3) and nitrate (NO_3). Excess amounts of nitrogen compounds can result in unusually large populations of aquatic plants and/or organisms that feed on plants. For instance, some algal blooms are a result of excess nitrogen entering the stream. As aquatic plants and animals die, bacteria break down the organic matter. Ammonia (NH_3) is oxidized (combined with oxygen) by bacteria to form nitrites (NO_2) and is then further processed to form nitrates (NO_3). The Missouri Water Quality Standards do not specify a maximum nitrate criterion for surface water in streams, unless they are designated for use as a drinking water source.

2.0 DEFINITIONS AND ABBREVIATIONS

CSI – Cooperative Stream Investigation
MDC – Missouri Department of Conservation
mg/L – milligrams per liter
MoDNR – Missouri Department of Natural Resources
MoST – Missouri Stream Team
 $\text{NO}_3\text{-N}$ – Nitrate as Nitrogen
SOP – Standard Operating Procedure
VWQM – Volunteer Water Quality Monitoring
QAPP – Quality Assurance Project Plan
QA/QC – Quality Assurance/Quality Control

3.0 SUMMARY OF METHOD

The nitrate method described in this SOP is used by the MoST, VWQM Program participants that have received Level 1, Level 2, Level 3 or CSI Program training. Further background information can be found in the MoST, VWQM Level 1 Notebook and PowerPoint Presentation on water chemistry (see Section 10.0).

4.0 HEALTH AND SAFETY REQUIREMENTS

Appropriate protective gear, such as gloves, safety eye wear, and water proof boots, should be worn to protect against encountering potential water-borne illnesses during sampling. It is also advisable to frequently wash hands with soap and water, especially before eating or drinking.

Those participants that monitor near wastewater outfalls should be vaccinated for Hepatitis A. Please contact your county health department or your personal physician for this vaccination.

5.0 PERSONNEL QUALIFICATIONS

Participants will be knowledgeable of this SOP and will have, at a minimum, attended an Introductory and Level 1 VWQM workshop.

6.0 SUPPLIES AND EQUIPMENT

The Program provided LaMotte nitrate tablet kit (#3354-01) is needed to measure nitrate in streams.

7.0 PROCEDURE

1. Rinse the sample bottle three times with stream water.
2. Fill the sample bottle with stream water.
3. Rinse the test tube with stream water and fill to the 5.0 mL line with water from the sample bottle.
4. Add one Nitrate #1 Tablet.
5. Cap and mix until the tablet disintegrates.
6. Place the test tube into the foil protective sleeve.
7. Add one Nitrate #2 CTA Tablet.
8. Cap the test tube and mix for (2) minutes to disintegrate the tablet.
9. Set a timer and wait (5) minutes.
10. Remove the test tube from the protective sleeve.
11. Inset the test tube into the Octa-Slide 2 Viewer (color comparator).
12. Hold the Viewer so that non-direct light enters through the back.
13. Match the sample color to a color on the Viewer.
14. Record the result on the data form as: $\text{NO}^3\text{-N}$ mg/L.
15. Containerize the liquid waste in a waste container and pour down the drain after returning home.

8.0 SPECIAL CONSIDERATIONS

- Nitrate #2 CTA Tablets are sensitive to UV light. Always use the Protective Sleeve to protect the reaction from UV light.
- When measuring liquids, the bottom of the meniscus should be touching the graduated line on test tube.
- Hold the Octet Comparator up to a white sheet of paper to help match the sample color to a color standard.
- Report results either as discrete number of the color standard shown on the color comparator or as a range (example: > 4 and < 6 mg/L).
- Do NOT multiply result by 4.4 as suggested in final step of kit directions. Record the reading taken directly from the comparator on your data sheet. Results will be reported as nitrate as nitrogen in mg/L.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

As part of attending a Level 2 QA/QC workshop, nitrate kits will be checked against a reference standard. Kits that cannot measure ± 1.0 mg/L of the reference standard will be replaced.

Level 2 and Level 3 workshop QA/QC is covered under a MoDNR QAPP (see Section 10.0).

10.0 REFERENCES

Missouri Department of Natural Resources. Quality Assurance Project Plan for Level 2 and Level 3 Volunteer Water Quality Monitoring.

Missouri Stream Team – Volunteer Water Quality Monitoring Program; Level 1 Volunteer Water Quality Monitoring Training Notebook, Chapter 2, Water Chemistry

http://www.mostreamteam.org/Documents/VWQM/Level1_Notebook/04_Chapter2_Chemistry.pdf

Missouri Stream Team – Volunteer Water Quality Monitoring Program; Level 1 Volunteer Water Quality Monitoring Workshop PowerPoint Presentation, Water Chemistry

http://www.mostreamteam.org/Documents/VWQM/Level1_PPT/Chapter%20%20-%20Water%20Chemistry.pdf