



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

ORIGINAL EFFECTIVE DATE: January 25, 2018
RECERTIFICATION DATE:
SOP TITLE: MoST-VWQM-SOP: Nitrate Measurement of Streams
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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
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1.0 SCOPE AND APPLICABILITY

This Standard Operating Procedure (SOP) provides MoST, VWQM Program participants with guidance on the operation of the LaMotte NCR nitrate test kit in conducting 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.

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, must be worn to protect from reagent toxicity and 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 following equipment is needed to measure nitrate:

- Program provided LaMotte NCR nitrate kit
- Program provided nitrate waste container

7.0 PROCEDURE

1. Rinse the sample bottle three times with stream water.
2. Fill the sample bottle with stream water.
3. Rinse test tube with stream water and fill to the 2.5 mL line with water from the sample bottle.
4. Dilute the sample to the 5 mL line with Mixed Acid Reagent.
5. Cap and mix by inverting test tube a few times.
6. Wait 2 minutes.
7. Use the 0.1g spoon to add one level measure (avoid any excess) of Nitrate Reducing Reagent.
8. Cap the test tube and invert gently 50-60 times within one minute.
9. Wait 10 minutes.
10. Inset the test tube into Octet Comparator (color comparator).
11. Match sample color to a color standard.
12. Record nitrate as nitrogen ($\text{NO}^3\text{-N}$) results in mg/L.
13. Containerize the liquid waste in a waste container provided by the Stream Team Program and rinse the test tube and test tube cap three times with stream water, pouring the rinsate into the liquid waste container.
14. Return the waste container labeled "Stream Team Nitrate Waste" to the VWQM Program for proper disposal when needed.

8.0 SPECIAL CONSIDERATIONS

- When measuring liquids, the bottom of the meniscus should be touching the graduated line on test tube.
- Place test tube in slot provided in the color Comparator when timing reactions.
- Be aware of wind direction when measuring out Nitrate Reducing Reagent (contains cadmium powder). Avoid monitoring in windy conditions to prevent powder from blowing into eyes, nose, or mouth.
- Hold the Octet Comparator up to a white sheet of paper to match the sample color to a color standard.
- Cap reagent bottle tightly and reattach brown electrical tape to cap to avoid moisture from entering reagent bottle.
- Report results either as discrete number of color standard shown on the 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 on your data sheet the reading taken directly from the comparator. Results should be reported as nitrates as nitrogen. Multiplying the result by 4.4 converts it to a straight nitrate reading.

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