

# Flint River GREEN: Nitrates



<b>MATERIALS</b>	<p>LaMotte Nitrate Test Kit</p> <p>Gloves</p> <p>Safety Goggles</p> <p>Stopwatch or Timer</p>	<b>VOCABULARY</b>	<p>Nitrogen (N)</p> <p>Nitrate (NO<sub>3</sub>)</p> <p>Nitrogen Cycle</p> <p>Eutrophication</p> <p>Nitrate-Nitrogen (NO<sub>3</sub>-N)</p> <p>Buffer Strip</p>
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<b>WATER QUALITY STANDARDS</b>	<p><u>DRINKING WATER:</u></p> <p>≤ 10 mg/L <u>nitrates</u></p>	<p><u>SURFACE WATER:</u></p> <p>≤ 20 mg/L <u>nitrates</u></p>
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<b>WHAT DOES THIS TEST MEASURE?</b>	<p><b>Nitrogen</b> is the most abundant element in the Earth’s atmosphere, making up about 78% of the air around us. <b>Nitrates</b> are a form of nitrogen that all plants need to grow. Nitrogen is a gas and in order for it to be accessible to plants and other organisms it must be converted into water soluble forms such as <u>nitrates</u> during the <b>nitrogen cycle</b>. High levels of nitrates in surface water can lead to increased plant growth which could cause <b>eutrophication</b>. If the stream is used as a drinking water supply, this could negatively affect the health of those drinking the water if it is not properly treated.</p>
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<b>LOOK FOR THESE CAUSES</b>	<p><u>EVIDENCE FOR DECREASES IN NITRATES?</u></p> <ul style="list-style-type: none"> <li>• Are there sustainable farming practices (such as soil testing to determine proper fertilizer application, <b>buffer strips</b>, crop rotation, cover crops, and organic farming)?</li> <li>• Are riverbanks and riparian areas healthy?</li> <li>• Are wells &amp; sewer/septic systems maintained?</li> </ul>	<p><u>EVIDENCE FOR INCREASES IN NITRATES?</u></p> <ul style="list-style-type: none"> <li>• Are there places that use fertilizers nearby?</li> <li>• What sources of animal manure (pets, wildlife, farm animals) are nearby?</li> <li>• Are there possible failing septic/sewer systems?</li> <li>• Do you see decomposing plant material?</li> <li>• Are there sources of detergents nearby?</li> </ul>
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<b>CONNECTING CONCEPTS</b>	<ul style="list-style-type: none"> <li>• Like phosphorous, excess nitrogen causes extra plant growth. When those plants die, they decompose. Decomposition uses up oxygen which affects how much oxygen is available for organisms in the water.</li> <li>• A bag of fertilizer is labeled with three numbers. The first number indicates how much nitrogen is available for plants. A 100 pound bag of 12-0-0 fertilizer contains 12 pounds of nitrogen for plants.</li> <li>• High nitrate levels in drinking water have been known to cause a potentially fatal blood disorder in infants called "blue-baby" syndrome (a reduction in the oxygen-carrying capacity of blood).</li> </ul>
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<b>WEB LINKS</b>	<ul style="list-style-type: none"> <li>• Video (4 min.) - The Nitrogen Cycle. University of Southern California: <a href="https://www.youtube.com/watch?v=PfqvACMyg68">https://www.youtube.com/watch?v=PfqvACMyg68</a></li> <li>• Case Study Student Activity—The Dead Zone: Ecology and Oceanography in the Gulf of Mexico. National Center for Case Study Teaching in Science: <a href="http://sciencecases.lib.buffalo.edu/cs/files/dead_zone.pdf">http://sciencecases.lib.buffalo.edu/cs/files/dead_zone.pdf</a></li> <li>• USGS Report— Nitrogen in the Mississippi Basin: Estimating Sources and Predicting Flux to the Gulf of Mexico: <a href="https://pubs.usgs.gov/fs/2000/0135/report.pdf">https://pubs.usgs.gov/fs/2000/0135/report.pdf</a></li> <li>• Video (8 min.) - Ecosystems on the Edge: Nutrient Odyssey. Smithsonian. <a href="https://ecosystemsontheedge.org/nutrient-odyssey/">https://ecosystemsontheedge.org/nutrient-odyssey/</a></li> </ul>
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1. Check to be sure everyone is wearing gloves and goggles. **This test is very hazardous.**
2. Inventory the supplies in your test kit.
3. Rinse and then fill a sample bottle with water from the stream using standard water quality testing collection procedures.
4. Determine which Nitrate kit you are using before proceeding: you will either find **(A.)** an Octet Comparator with shades of color built into the viewer and short, glass test tubes. OR **(B.)** an Octa-Slide 2 Viewer with a color bar that slides in and out of the viewer and tall plastic test tubes. Follow the instructions below that correspond to the correct test kit you are using:

**Test Kit A (Octet Comparator):**



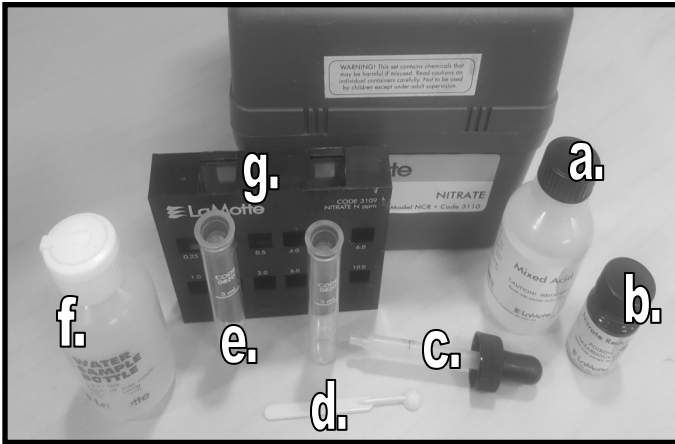
**Test Kit B (Octa-Slide Viewer):**



5. Fill a test tube to the 2.5 mL line with water from the sample bottle.
6. Add 2.5 mL mixed acid by filling the tube until the liquid reaches the 5 mL line using a dispenser cap or eye dropper. Do not pour chemical directly from the bottle.
7. Cap and mix gently. Wait 2 minutes.
8. Add 0.1 g of Nitrate Reducing Reagent using the 0.1 g spoon.
9. Cap and invert gently for 60 times in one minute.
10. Wait 10 minutes.
11. Insert test tube into the comparator and match the sample to a color standard. If using The Octa-Slide Viewer, be sure to also insert the Octa-Slide Bar into the comparator.
12. Match sample color to a color standard and record as ppm **Nitrate-Nitrogen (NO<sub>3</sub>-N) : \_\_\_\_\_ ppm**
13. Convert to Nitrate: multiply your result by 4.4: \_\_\_\_\_ ppm x 4.4 = \_\_\_\_\_ mg/L Nitrate (NO<sub>3</sub>)
14. Dispose of your sample and rinse the test tube into the hazardous waste container.
15. Calculate a Q-Value on the Nitrate Chart using your value from Step 13 (NO<sub>3</sub>): **Q-Value: \_\_\_\_\_**
16. Check the Q-Value by entering your Nitrate-Nitrogen (NO<sub>3</sub>-N) data at <http://www.flintrivergreen.org/add-info/add-data/>

**WHAT TO WATCH OUT FOR**

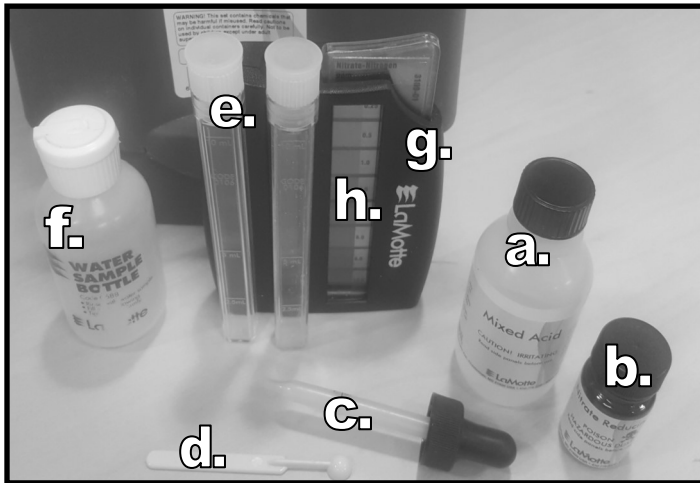
- Add chemical to the test tube and not the sample bottle.
- Be sure to wait the full ten minutes!
- Remember that ppm is equal to mg/L.
- Be sure to convert to Nitrate before using the Q-value graph.
- When entering your field data on the WQI data sheet, enter your ppm Nitrate-Nitrogen (before you multiplied by 4.4).
- It's a good idea to perform a colorblindness test prior to viewing color scales such as pH. There are many free versions online.



## Kit A: Octet Comparator Nitrate Kit

### Contents

- a. Mixed Acid Reagent - [V-6278-H]
- b. Nitrate Reducing Agent - [V-6279-C]
- c. Eye Dropper OR White Dispenser Cap - [0692]
- d. Spoon, 0.1g, plastic - [0699]
- e. (x2) Test Tubes, 2.5 & 5.0mL, glass, w/caps - [0820]
- f. Bottle, Water Sample - [0688]
- g. Nitrate-N Comparator, 0.25-10.0ppm - [3109]



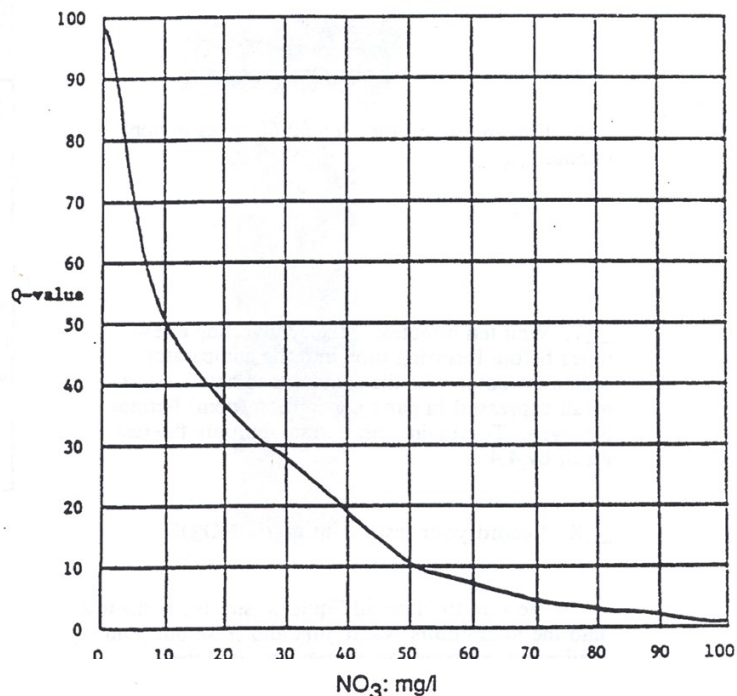
## Kit B: Octa-Slide Nitrate Kit

### Contents

- a. Mixed Acid Reagent - [V-6278-H]
- b. Nitrate Reducing Agent - [V-6279-C]
- c. Eye Dropper OR White Dispenser cap - [0692]
- d. Spoon, 0.1g, plastic - [0699]
- e. (x2) Test Tube, 2.5-10mL, plastic, w/caps - [0106]
- f. Bottle, Water Sample - [0688]
- g. Nitrate-N Octa-Slide 2 Bar, 0.25-10.0ppm - [3109-01]
- h. Octa-Slide 2 Viewer - [1101]

## Nitrate Q-Value Chart

Chart 7: Nitrate (as NO<sub>3</sub>)



Note: if NO<sub>3</sub> > 100.00, Q=1.0