G. Nitrates

i. Why is this test important/What does it measure

Nitrogen is the most abundant element in the Earth's atmosphere, making up about 78% of the air around us. Nitrates are a form of nitrogen that all plants need to grow. When you purchase a bag of fertilizer, the first number on the bag represents the amount of available nitrogen for plants. Form example, if you buy a hundred pound bag of 12-0-0 fertilizer, 12 pounds of that bag will be nitrogen. Nitrogen can be converted to nitrates through nitrogen fixing bacteria or lightning. Nitrogen fixing bacteria often exist in the roots of plants called legumes, such as clover or beans.
High levels of nitrogen in surface water can lead to increased plant growth. When those plants die, they rot. That decomposition process uses up oxygen so there is not as much available for fish and other life in the water. High nitrate levels in drinking water can prevent babies from carrying oxygen; hence the nickname "blue baby" syndrome (methemoglobinemia). Nitrates can enter a body of water through fertilizers, animal manure (including from pets, wildlife, or farm animals), failing human septic and sewage treatment systems, and decomposing plant material.

ii. Water Quality Standards

Current drinking water standards for nitrates, set by EPA are 10 mg/L nitrates (measured as nitrogen) [what does that mean]. Even levels below this can cause "blue baby syndrome" or shortness of breath in some infants.
Surface water quality standards are 20 mg/L

iv. How to conduct the test:

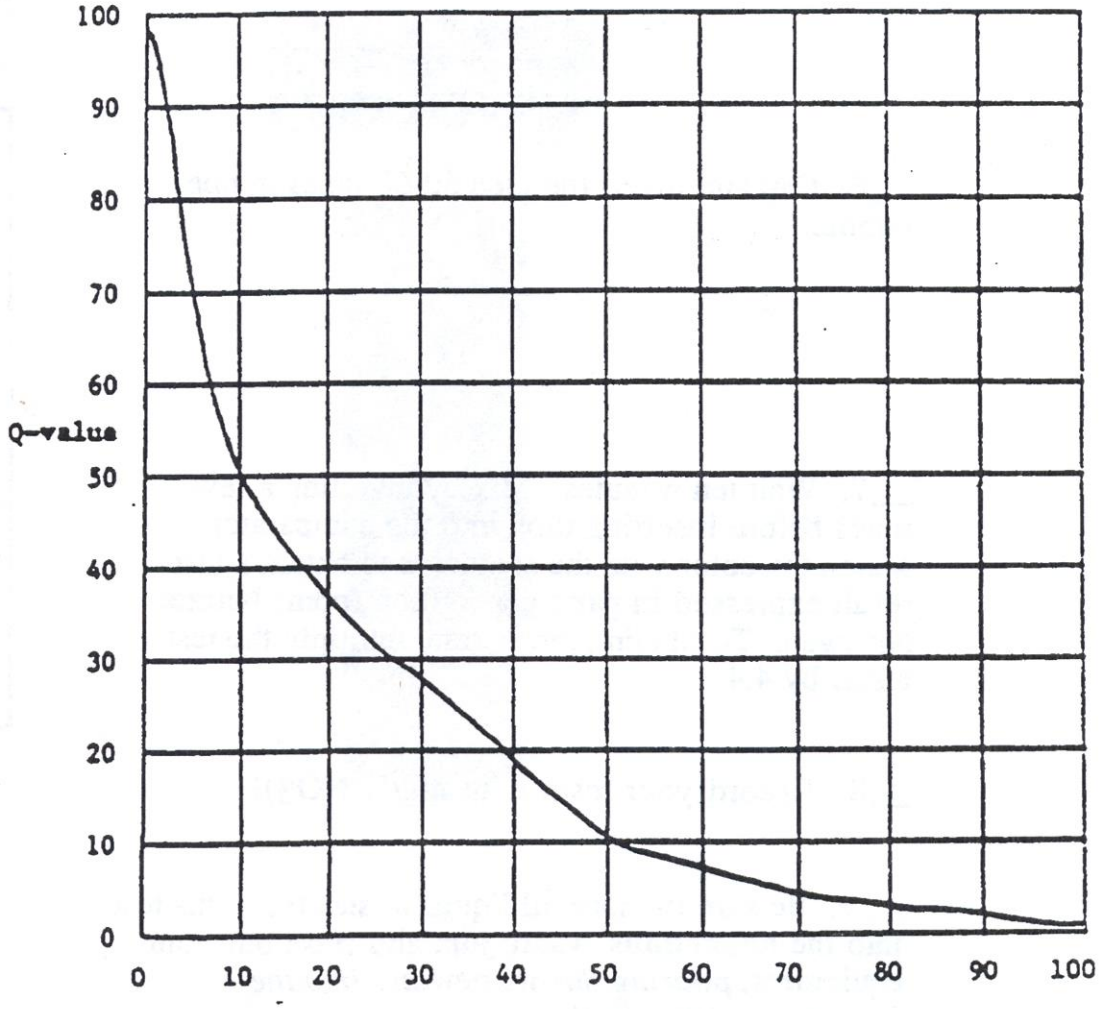
NOTE: THIS TEST HAS HAZARDOUS WASTE MATERIALS: PLEASE WEAR GLOVES & GOGGLES AND MAKE SURE WASTE IS DISPOSED OF PROPERLY

1. All glassware must be cleaned with dilute HCL and rinsed with deionized water before the test is taken out to the lake. Do not rinse with distilled water; it contains ammonia (NH3) which will interfere with the test. If you cannot rinse with deionized water; rinse all glassware with the sample water(ie water from the river)
2. Fill the sample bottle with sample water (Please note the difference between the sample bottle and the test tube; fill the sample bottle so you can re-do the test if needed)
3. Fill the test tube to the 2.5mL line with water from the sample bottle
4. Dilute to 5 mL line with Mixed Acid Reagent. Cap the test tube and mix by inverting the test tube
5. Use the .1 gram spoon to add one level measure of Nitrate Reducing Agent. Cap and invert the sample approximately 60 times in one minute.
6. Wait 10 minutes
7. Insert the test tube into the Nitrate Comparator. Match the colors in the sample.
8. Record ppm Nitrate as Nitrate Nitrogen. To convert to Nitrates multiply by 4.4

iii. Determining the Q-Value

FIELD MANUAL FOR WATER QUALITY MONITORING

Chart 7: Nitrate (as NO^3)



NO_3: mg/l

Note: if NO_3>100.00, Q=1.0

v. Common Mistakes
-Not waiting the full 10 minutes for the test to finish
-recording the amount incorrectly on the data sheet
-adding the chemicals to the sample bottle instead of the test tube

vi. Consistency when doing multiple tests:
This test is very time-intensive, so doing multiple tests can be difficult. If you do multiple tests, use the average (arithmetical mean) and report that result. If the results are drastically different, contact your mentor or FRWC staff for help making a decision on whether or not to report those results

vii. How to Analyze Why The Results is Good or Bad

Any results over 10ppm nitrates could lead to potential increased plant growth in a stream. If the body of water is used as a drinking water supply, this could negatively affect the health of those drinking the water if it is not properly treated.

H. Phosphorus

I. Why is this test important?

Phosphorus (P) is an element and is abundant in the earth's crustal material. About 12% of the earth's crust is P, chiefly as calcium phosphate. It is an important plant nutrient, that helps root and flower development. If you buy a bag of fertilizer at the store, the middle number on the bag is the percent of phosphorus by weight. For example, a hundred pound bag of 12-10-10 fertilizer will contain 10 pounds of phosphorus.

Phosphorus makes plants grow in lakes & streams. A pound of phosphorus entering a lake or stream can lead to 500 pounds of "seaweed" or algae growth in that lake or stream. When those plants die, they rot. That decomposition process uses up oxygen so there is not as much available for fish and other life in the water. Too much phosphorus can also lead to algae blooms in the water. Some kinds of algae are toxic to humans and pets. There have been cases of pets getting sick or dying from drinking lake or pond water with toxic algae.

Because of these issues, several communities in Michigan (Allegan, Bay, and Ottawa Counties) and the entire state of Minnesota have banned phosphorus from lawn fertilizers. It has already been banned from laundry detergents and dishwasher detergents.

Phosphorus gets into streams mostly through soil erosion. Phosphorus does a good job of "sticking to" particles of soil and wash into the stream. Phosphorus can also enter a body of water through fertilizers, animal manure (including from pets, wildlife, or farm animals), and decomposing plant material.

Understanding the difference between phosphorus, phosphate, and orthophosphate can be confusing. Phosphorus, is an element (P) that rarely exists in its pure form in nature. Phosphorus occurs in natural waters almost always as