November 2007

Nitrates

Nitrogen is found in several different forms in terrestrial and aquatic ecosystems. These forms of nitrogen include ammonia (NH_3), nitrites (NO_2), and nitrates (NO_3). Ammonia is oxidized to nitrite and then to nitrate with the decomposition of the organic matter, using dissolved oxygen in the process.

Both nitrates and phosphates are essential plant nutrients applied as fertilizers. Their presence in water can be beneficial since they will increase algae and plant growth and, thus, increase the food supply for fish and other higher members of the food chain. However, when excessive amounts of phosphorus and nitrates are added to the water, algae and aquatic plants can be produced in large quantities. When the algae die, the decomposition activity uses oxygen. This process is called eutrophication. Dissolved oxygen concentrations can drop too low for fish to survive, leading to the loss of some aquatic life forms.

Nitrates are highly soluble in water, and this nitrogen form is stable over a wide range of environmental conditions. Nitrates are easily transported in streams and groundwater. Sources of nitrates include wastewater treatment plants, runoff from fertilized lawns and cropland, septic systems failures, runoff from animal manure storage areas, and industrial discharges that have corrosion inhibitors.

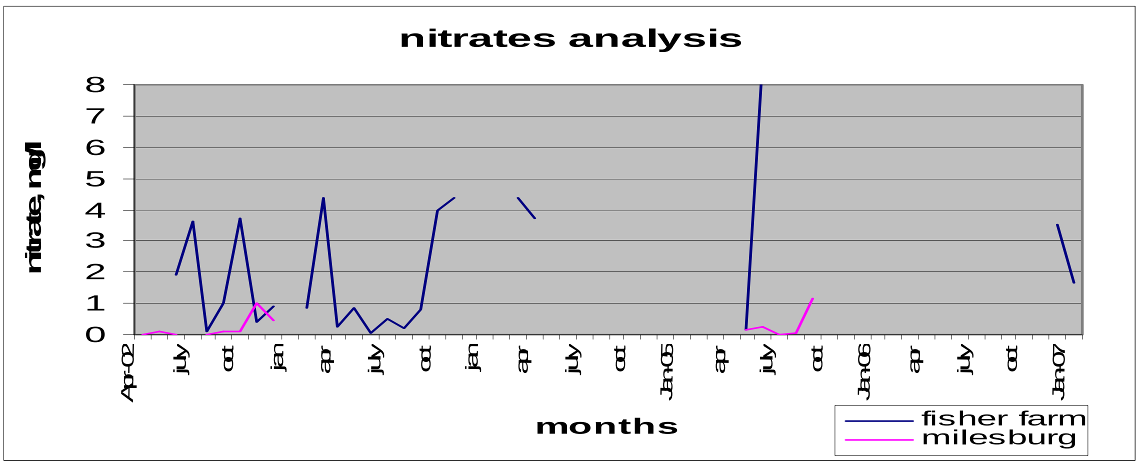
The normal nitrate concentration in water is low. The natural level in surface water is typically less than 1 mg/L. Nitrates in river water can range between 0.01 and 3 mg/L. Elevated concentrations are indicative of the use of nitrate fertilizer, animal waste, or septic tank issues. The effluent of wastewater treatment plants can range up to 30 mg/L. The EPA water regulatory maximum limit is 10 mg/L.

There were five samples compared with an external lab for nitrates. Only 1 of 5 samples met the 20% maximum RPD target of the PaSEC QAPP. With this limited sampling, there was a consistent trend in the readings. At the high nitrate levels, the PaSEC analytical values (from 3 different teams) were higher than the lab values.

sample	team	external		PaSEC mg/l	external mg/l	difference in analysis	RPD %	difference in analysis	RPD %
location 1	x	UAJA		0.22	1.31			-1.09	142
location 2	x	UAJA		6.18	5.36	0.82	14		
location 1	y	UAJA		0.92	1.31			-0.39	35
location 2	y	UAJA		10.56	5.36			5.2	65
location 1	z	UAJA		8.36	4.70			3.66	56
			average	5.2	3.6				
			range	**0.22-10.56**				overall RPD ave = 62 %	

The color intensity match of the nitrate sample to the color wheel is a tricky test. It includes the usual potentials for error in sample collection, analysis preparation, shaking, and settling time. In addition, it has potential error in sample dilution (high nitrates), light sourcing / reading, and color intensity interpretation. These potentials for error can be cumulative, and the final result can be expanded with the factor multipliers. For example: the color wheel is marked into .02 divisions, and one mark variation in a visual interpretation can lead to nearly 0.9 mg/L difference in the reported value for the high nitrate analysis (reading x 10 x 4.4).

Team 4 has a history of two sampling locations with different nitrate levels, one low (<1 mg/L) and one high (peaks of 3-5 mg/L). The high reading location is cyclic. Notice the sample locations on the map . The high nitrate levels occur next to the farmland.



In 2008 the colorimeter will be used for comparisons against the color wheel readings. Each team will have the colorimeter employed with the field QC duplication check. Data will be collected for both test methods to determine any trends and differences. jmm