Nitrates in Drinking Water
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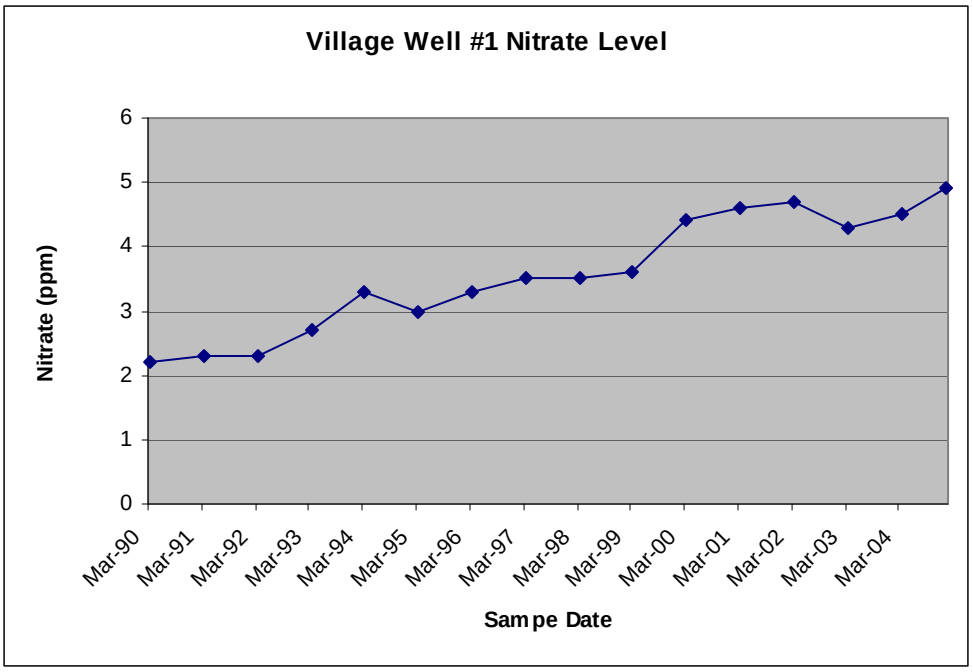
Nitrogen, commonly applied to our lawns, golf courses, and agricultural fields is converted to nitrate by bacteria in the soil. The nitrate form of nitrogen moves very easily with water, can leach beyond the plant root zone, and may eventually reach the groundwater table. Herein lies the problem for numerous water systems and an unknown, but significant number of private well owners throughout the state.

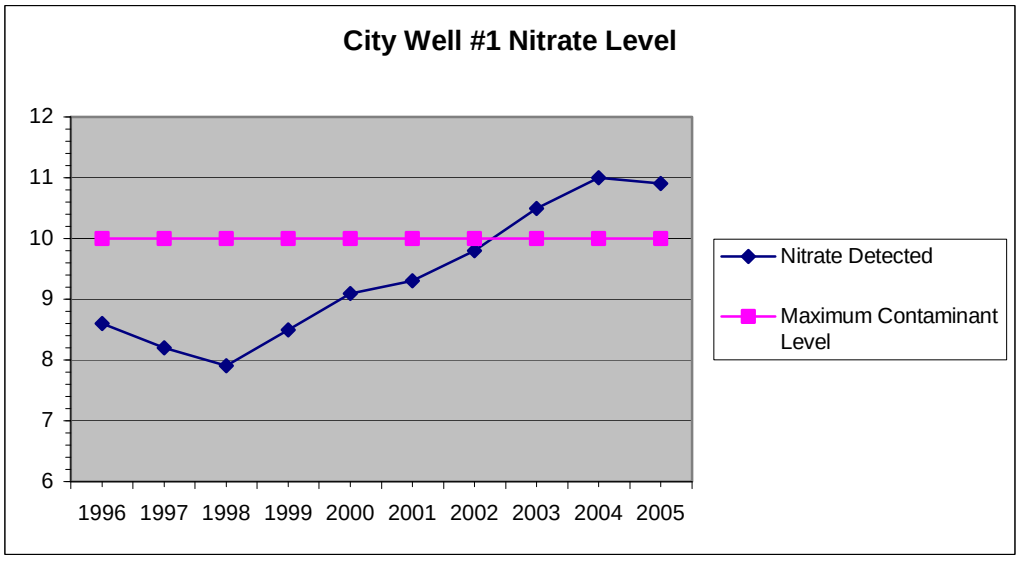
The maximum contaminant level for nitrates in drinking water provided by a public water system is 10 parts per million (ppm). Nitrate is regulated for its potential to cause methemoglobinemia or blue baby syndrome. This condition primarily affects infants under six months of age. The stomach acid of a young infant is not as strong as it is in older children and adults. As a result, nitrate is converted to nitrite in the infant's body. Nitrite in the bloodstream causes hemoglobin (which carries oxygen in the blood) to convert to methemoglobin (which does not carry oxygen efficiently). Babies in this situation may exhibit a bluish color around the mouth and eyes. It is easily treated if detected in time. If left untreated, brain damage and death can result. Due to the potential for birth defects, pregnant women should also avoid consuming water with nitrate levels above 10 ppm.

Most of us can tolerate higher levels of nitrate with little or no obvious health effects. Persons with reduced stomach acidity or an impaired enzyme system are at greater risk than the general population and could develop methemoglobinemia. A potential cancer risk from nitrate in water and food has been reported. It is possible that nitrate in our body may be converted to nitrosamine, a known cause of cancer.

As discussed in my last article, communities must choose from a short list of options when dealing with high nitrates. For some communities, developing a wellhead protection plan is a viable alternative, especially if they see the problem coming. Recall the following graph of nitrates for this water system well:



If immediate action is taken, here is a community that has a good chance to implement a local wellhead protection plan that has the potential to keep nitrate levels from exceeding 10ppm.



At this point, the horse is already out of the gate, past the finish line, and probably past the county line. Developing a wellhead protection plan to address nitrates might buy some time for the community by satisfying an administrative order. But it is not likely to achieve a reduction in nitrate levels before they reach 15 ppm, and the community will have to secure a new water source or build a treatment plant.

To address nitrates, or any other potential contaminant, sources of nitrates in the wellhead protection area must be determined. Documenting the location of nitrate sources such as septic systems, animal feedlots, abandoned feedlots, fertilizer storage facilities and golf courses is necessary. Determining the number of farm acres that undergo routine application of fertilizers is also necessary. This is carried out through the Contaminant Source Inventory (CSI). By completing a CSI, the location of all existing and historical contaminants in the wellhead protection area are well documented, not just sources of nitrates.

The difficult task of managing sources of nitrates is the next step. Good relations and a lot of cooperation with residents and landowners are needed to make your protection strategy work. Community leaders may invite residents and landowners to an informational meeting to discuss nitrate concerns and possible solutions. Some out of the box thinking might be necessary. For example, several communities in Iowa have been able to enroll wellhead protection area land in the Conservation Reserve Program (CRP). The CRP program pays landowners to take eligible land out of crop production and put it into permanent vegetation. CRP is administered within each county through the local Farm Service Agency office. These Iowa communities realized the benefits of CRP to groundwater quality and were willing to reach into the village's own pockets to provide the landowner with an extra CRP incentive payment. When you put a pencil to it, it's not as expensive as you might think. For example, if the town paid $15 per acre on 160 acres surrounding their well, they would spend $2400 per year and $24,000 over a ten-year period. Is this going to be a sure fix for increasing nitrates? Only time will tell, but if it does work this would be a great alternative to the cost of a new well and mainline to town or a treatment facility to remove nitrates.