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YOUR HOUSEHOLD WATER QUALITY: NITRATE AND NITRITE IN WATER

Private well owners are responsible for the safety of their drinking water. Maintaining a healthy well requires routine testing for possible contaminants, including nitrate and nitrite. To assist in water safety, the EPA has set standards for nitrate levels in public drinking water systems. Although private well owners are not required to meet these standards, they do serve as a reference for safe drinking water. The EPA Maximum Contaminant Level (MCL) nitrate is: 10 ppm (parts per million) or mg/L (milligrams per liter) nitrate-nitrogen or, if expressed as nitrate, 45 ppm. For nitrite, the MCL is: 1 ppm or mg/L nitrite-nitrogen or, 3.28 ppm if expressed as nitrite. Nitrite is not stable in water and rapidly transforms to nitrate fairly easy. Its presence is an indicator of high concentrations of either nitrate or ammonia.

WHAT CAUSES NITRATE AND NITRITE CONTAMINATION?

While there are several potential sources, the three most common are:

1. Overuse of nitrogen-based fertilizers
2. High concentrations of animal manure too near the well
3. Septic systems too near the well

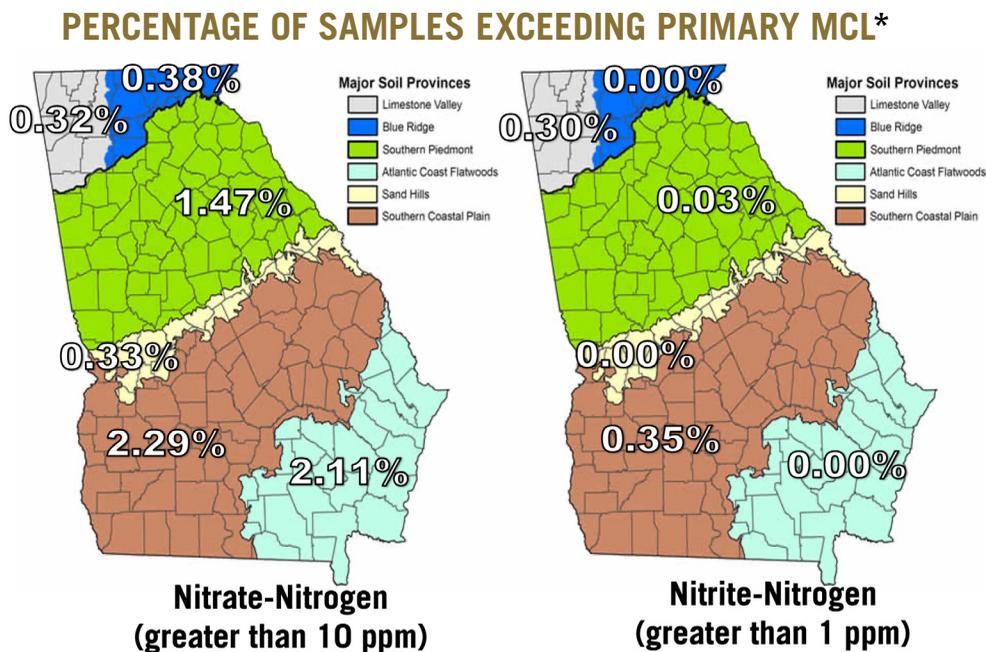
Nitrate and nitrite form naturally in soil from the decomposition of soil organic matter, from application of organic materials like animal manure, and from application of nitrogen fertilizers. Contamination problems occur when nitrate and nitrite from these sources are overapplied to lawns, gardens, crop land, or pastures. If there is more nitrite and nitrate than plants can use, they can move easily through the soil with excess rainwater and can end up in groundwater. Poultry and livestock operations produce large amounts of manure that can be a source of nitrate and nitrite. Good management practices can prevent this form of groundwater contamination. Septic systems are another source of nitrate and nitrite found in well water. Septic systems that have been properly sited, installed, and maintained do not usually create a problem. However, in older developments where septic systems are used with small lot sizes, the risk of nitrate and nitrate contamination is increased. Older septic systems that have not been maintained can also be a source of contamination. The closer your well is to your septic system, the higher the risk.

TO WHAT EXTENT ARE ELEVATED NITRATE AND NITRITE CONCENTRATIONS FOUND IN HOUSEHOLD WELL WATERS IN GEORGIA?

Elevated levels of nitrate and nitrate are found in some household wells in Georgia with contaminations more prevalent in the Southern Coastal Plain, Atlantic Coast Flatwoods, and Sothern Piedmont than other areas (Figure 1).

Figure 1. A graphical summary of the statistics for nitrate and nitrite concentration above their primary MCLs based on over 15,283 and 7,486 household well water samples that were analyzed for nitrate and nitrite, respectively between January 1, 2000 and September 8, 2020, at the University of Georgia's Agricultural and Environmental Services Laboratories.

*United States Environmental Protection Agency (EPA) categorized nitrate, nitrite and some others as primary drinking water contaminants. **These contaminants in drinking water pose human health risks.** They are regulated by EPA's Primary Drinking Water Standards and the concentration limit is called the Primary Maximum Contaminant Level (MCL). **The Primary Drinking Water Standards are enforceable for Public Water Supplies, not for private wells.** However, private well owners are advised to follow *Primary Drinking Water Standards* for safety of their drinking waters.



WHY WORRY ABOUT NITRATE AND NITRITE?

There are potential health problems associated with high nitrate and nitrite levels in drinking water. High nitrate and nitrite levels can cause a condition called methemoglobinemia or "blue baby syndrome". Babies under six months of age, older people, pregnant women, people with low stomach acidity, and people who lack certain enzymes can develop methemoglobinemia. Symptoms include a bluish tint to the skin, headaches, dizziness, weakness, and difficulty breathing.

WHAT SHOULD I DO IF MY HOUSE WELL TESTS HIGH IN NITRATE AND NITRITE?

There are several steps you can take if your well tests high in nitrate. What works will depend on your individual situation.

- Determine the source of contamination and try to eliminate it. For example, apply only the amount of fertilizer or manure that plants can use.
- Make sure your wellhead is adequately protected (see Circular 858-1 on Protecting Your Wellhead).
- Install a point-of-use water treatment system such as an anion exchange resin, a reverse osmosis, a distillation system.
- Use bottled water for drinking and cooking.
- Switch to a public water supply if possible.
- Retest to see if corrective actions or treatment systems are working.

NITRATE - N LEVEL	RECOMMENDATION
>3 ppm	Test level once or twice a year to make sure this level is not increasing
>10 ppm	Install water treatment system or switch to another source of water for drinking

Nitrate and nitrite are usually low in Georgia groundwater (Figure 1). If you have nitrate-nitrogen concentrations greater than 3 ppm, you should test your house well water periodically to make sure the nitrate level is not increasing. Elevated nitrate concentration is often an indication that other contaminants--such as bacteria--are getting into your house well water. You should inspect your wellhead to make sure it is sound and properly protected, and periodically test your water for bacteria and other contaminants.

WHICH TREATMENT SYSTEM WILL REMOVE NITRATE AND NITRITE FROM MY WELL WATER?

If your well water has nitrate-nitrogen levels of 10 ppm or more and/or nitrite-nitrogen levels of 1 ppm or more, you should consider either a water treatment system or buying water for drinking and cooking. Treatment systems effective for the removal of nitrate and nitrite include distillers, anion exchange resins, and reverse osmosis. You should contact a water treatment professional to discuss the best system for your needs. Home treatment equipment using these processes is available from several manufacturers. For more information about home water treatment systems, see *UGA CAES Bulletin 939: Water Quality and Common Treatments for Private Drinking Water Systems* and *UGA CAES Circular 858-3: Home Water Quality and Treatment*, available from the University of Georgia Extension publications website.

Note that carbon filters and standard water softeners do not remove nitrate and nitrite. Merely boiling water may increase rather than decrease the nitrate and nitrite concentration.

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