RESULT DEMONSTRATION REPORT

Presence of Nitrate, Salinity, Arsenic and Fecal Coliform in Ground and Surface Water

Cooperators: Private Water Well Owners

Starr, Hidalgo, Willacy, and Cameron Counties

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Summary

Individual water samples were collected and screened from area water wells and livestock tanks/ponds. These samples were screened for the presence of fecal coliform bacteria and also for arsenic, nitrate-nitrogen and salinity concentrations. A total of 43 water samples were submitted and screened for bacteria, nitrates, arsenic, and salinity. The presence of fecal coliform bacteria was found in 7 (8%) of these samples. The average nitrate concentration for all samples screened was 50 ppm with only thirteen (10) samples testing 10 ppm or more (10–50 ppm). Seventy-two (43) samples were tested for the presence of arsenic. One sample tested positive with an average of 5 ppb and a range of 1-14 ppb. The average salinity of all the samples was 3152 ppm with a range of 1222-13000 ppm.

Objective

It is important to periodically screen or test water wells for the presence of fecal coliform, total nitrate-nitrogen concentrations, arsenic and salinity. Bacteria and nitrates are the two most common contaminants found in private water wells and can serve as an indication of contamination to the groundwater supply by septic systems, livestock waste or the use of fertilizers. Such contaminations are harmful to individual and public health. High concentrations of salinity in water can injure plants if used for irrigation and animals if used as a source of drinking water.

Fecal coliform bacteria are bacteria present in the intestinal tract of warm-blooded animals and can be found in their wastes. The presence of fecal coliform bacteria can indicate the presence of harmful pathogens that cause diseases such as intestinal infections, dysentery, hepatitis, typhoid fever, cholera and other illnesses.

Nitrate is a combination of nitrogen and oxygen. This ion is one part nitrogen and three parts oxygen (NO_3). Consumption of groundwater with nitrate-nitrogen concentrations greater than 10 ppm is considered a health risk by the US-EPA. High levels of nitrates can be transformed to nitrite (NO_2) in the digestive system. The nitrite oxidizes iron hemoglobin of red blood cells to form methemoglobin, which lacks the oxygen-carrying ability of hemoglobin. This creates the condition known as methemoglobinemia (sometimes called “blue baby syndrome”), in which blood lacks the ability to carry sufficient oxygen to the individual body cells. At extreme levels, methemoglobinemia can result in convulsions and death. Infants, under 6 months of age, pregnant women, nursing mothers, elderly people or individuals with a depressed immune system are most susceptible to this condition.

Salinity is an indication of the number of salts dissolved in water. Salts in water influence the taste of water, can damage soils, cause salt burn in plants and at high enough levels can be toxic to plants and harmful to animals. Determining and knowing the concentration of total dissolved salts (TDS) in water enables the users of the water to better manage the use of their water for human consumption, livestock watering and/or irrigation. The US-EPA has set a secondary drinking water standard of 500 ppm for TDS. For livestock, TDS readings less than 3,000 ppm would pose little risk. Waters with TDS readings above 3,000 ppm should not use to supply drinking water for lactating livestock and waters above 7,000 ppm should not be used for any livestock at all. For irrigation purposes, waters with TDS levels below 175 ppm are safe, 175 to 525 ppm will damage salinity sensitive plants, 525 to 1,400 ppm damage to low salinity tolerant plants, 1,400 to 2,100 damage to plants with high tolerance to salinity, and 2,100 ppm are considered unsuitable for irrigation purposes.

Materials and Methods

On September 7th and 8th, 2022 43 water samples were collected and screened for the presence of fecal coliform bacteria, nitrates, arsenic, and salinity. To determine the presence or absence of fecal coliform bacteria, 100 milliliters (ml) of each water sample were mixed with a reagent (Colitag Water Test System) and incubated at 112^{o} F for a minimum of 18 hours. After the incubation period was complete, samples were removed and visually inspected for changes in color, indicating the presence of bacteria. The samples were also inspected in a dark room under an ultra-violet light to determine the presence of fecal coliform. The number of individual samples with fecal coliform was recorded and the percentage of fecal coliform contamination calculated. All results are reported in the Results and Discussion section of this report.

Nitrate concentrations for each well sample were determined using a colormetric-based analysis. Samples were exposed to a nitrate-test strip and the reaction allowed to occur for one minute. The resulting color change of the reactant paper was compared to a nitrate concentration chart and the concentration of the sample recorded. All nitrate-nitrogen concentration results were totaled and an average nitrate-nitrogen concentration for all water samples was determined.

Salinity concentrations were determined by use of a conductivity meter. Readings for each water sample submitted were taken and recorded in mS/cm. (milliSeimens per centimeter). This mS reading was converted to ppm. All salinity concentration results were totaled and an average salinity concentration for all water samples for the samples determined. All results are reported in the Results and Discussion section of this report.

Results and Discussion

A total of 43 water samples were submitted and screened for bacteria, nitrates, arsenic, and salinity. The presence of fecal coliform bacteria was found in 7 (8%) of these samples. The average nitrate concentration for all samples screened was 2.25 ppm with only thirteen (10) samples testing 10 ppm or more (10–50 ppm). Seventy-two (43) samples were tested for the presence of arsenic. One sample tested positive with an average of 5 ppb and a range of 1-14 ppb. The average salinity of all the samples was 3570 ppm with a range of 1222-13000 ppm.

Acknowledgments

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