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NAEW Information Sheet

Pasture Water Quality: Nitrogen

Why is reduction of nitrogen in water important?

High nitrogen levels in drinking water pose a human health problem by tying up iron in blood. This creates the potential for anemia, which can be particularly critical for infants (small bodies) and elderly people (poorer blood circulation). The maximum contaminant level for NO_3-N in drinking water is 10 ppm. High N levels in surface waters promote excessive algal growth. The death and decomposition of the algae consumes oxygen from the water and can kill other aquatic life, e.g. fish kills. This same process is involved in creating the "oxygen free" dead zone in the Gulf of Mexico, a condition known as hypoxia. Reduction of N in water would lessen the expense of municipal water treatment and decrease some of the detrimental environmental impacts.

What are some of factors that contribute to high nitrogen in water?

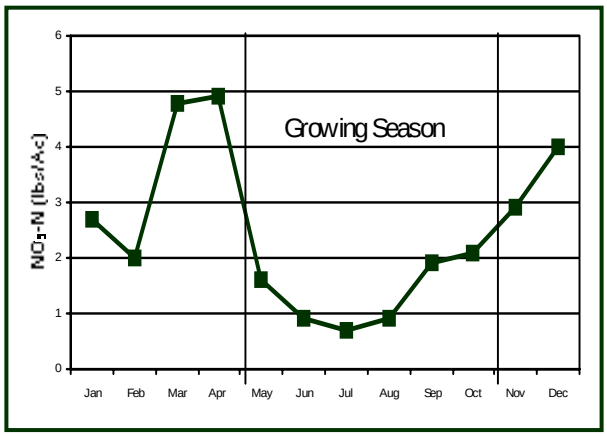
Nitrogen can enter water supplies from several sources, including municipal and industrial treatment facilities, septic systems, and agriculture. Agricultural contributions can come from over fertilization of row crops and from confined livestock operations where the manure is not spread at the appropriate times or over enough acreage.

- N loss from over fertilization can occur in surface runoff and by leaching through soil. Excess fertilizer may result from fertilizer being applied in excess of crop needs or from under utilization of fertilizer because of poor plant growth, e.g. resulting from floods or drought

- N loss from manure application can also occur in surface runoff and by leaching through soil. In confined livestock operations, especially where large numbers of animals are involved, land application of manure without over application can be quite challenging because of the expense of hauling it adequate distances from the barn and being able to haul/spread it during proper weather opportunities.

Can there be high nitrogen contributions to water from pastures?

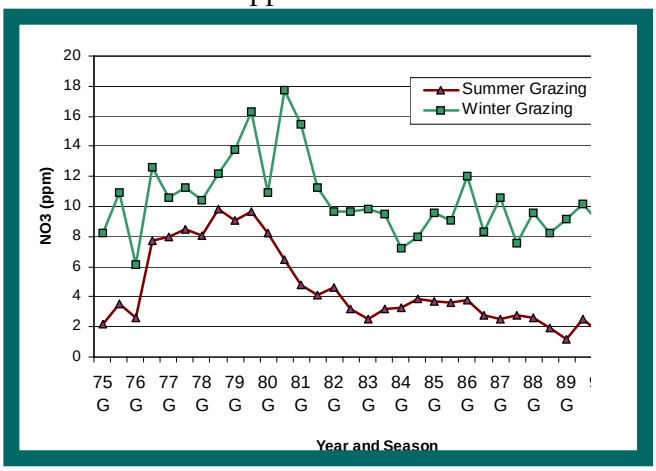
In any system where the N inputs exceed the plant usage, there will be N losses. This is true for forage systems, and animals in grazing system tend to increase the potential for N loss. High levels of NO_3-N have been found in groundwater under grazing systems that have received 150 lbs or more of N per acre annually. Most of the soluble N losses occur by leaching to groundwater and during late winter/early spring. This period follows soil moisture recharge and precedes major water usage by forage.



Graph – seasonal N movement (Fig 11)

What are some practices that would reduce the potential for N loss?

- Annual fertilizer rates should be 100 lbs of N per acre or less. All sources of N (fertilizer, manure, legumes) should be included in the calculations.
- The NO_3-N concentrations in groundwater under a grass-legume mixture pasture probably will be below the MCL. Legumes interseeded into grass instead of using N fertilizer should reduce NO_3-N leaching.
- When possible avoid applying fertilizer shortly before rainfall, especially heavy rainfall. The most likely times for high NO_3-N concentrations to occur in surface runoff are within a few days following fertilizer application.



Summary

Whenever a system has more N added than is utilized by the plants in the system, there is great potential for N loss. Even though forages can use a lot of N, high fertilizer and/or manure rates can produce excess N and cause NO_3-N concentrations to exceed MCLs. Although the manure from grazing livestock is "recycled" material, "hot spots" or patches of high N concentration are created in pastures with the deposition of manure and urine. Because of these hot spots, there can be more N leaching in pastures than in hay fields. Therefore, fertilizer recommendations may be lower for pastures than for hay areas. Nitrogen additions to pastures should not exceed 100 lbs per acre annually to be environmentally sustainable. Using a grass-legume mixture for grazing instead of high fertilizer rates on grass should keep NO_3-N levels below MCLs in groundwater.

(Information based on research conducted at the North Appalachian Experimental Watershed near Coshocton, Ohio. The NAEW is a USDA-Agricultural Research Service location working in cooperation with the OSU/OARDC. NAEW, USDA-ARS, P.O. Box 488, Coshocton, Ohio 43812)