UTAH STATE UNIVERSITY
COOPERATIVE EXTENSION SERVICE

EC425.4

UTAH WATER QUALITY

FERTILIZER IMPACT ON GROUNDWATER IN UTAH

T.A.Tindall, R.W. Hill, H.M. Deer, R. Peralta

Water quality has become the focal point of many decisions involving crop production. Crop production depends on specific inputs including fertilizer application. Without proper fertilization a farmer cannot achieve maximum **economic** returns. Crop yields in Utah have been increased over 50% by nitrogen fertilizer application alone. However, increasing nitrogen application beyond that needed for optimum economic return does more harm than good. This is especially true when groundwater concerns are addressed.

Increased public awareness of the need for groundwater purity raises important questions concerning fertilizer nitrogen application and the specific role of **nitrate**. Nitrate is the primary form of nitrogen used by plants. Nitrogen itself is the most limiting nutrient element in plant development. Because of this limitation large amounts of nitrogen are applied to agricultural and urban soils. Homeowners will often use over 200 pounds per acre nitrogen for lawns. A primary concern involving nitrogen and groundwater quality is related to the mobile nature of nitrate through the soil system and its potential for groundwater contamination. Elemental nitrogen cannot be used by plants, but must first be converted to either ammonium or nitrate. Nitrogen in the ammonium form is relatively immobile and attaches to clay particles. Unfortunately, ammonium is converted to nitrate naturally in the soil system. This conversion is rapid during hot summer months. Nitrate, unlike ammonium, is mobile within the soil system. In coarse-textured soils (sand and gravel) nitrate may move completely out of the crop root zone in a single year depending on irrigation practices, precipitation and nitrogen application management

Many Utahans are concerned about the impact of nitrates in drinking water. Fertilizer nitrogen is only one potential source of nitrate pollutants. Other potential sources include sewage disposal systems, livestock facilities, land-applied manure, municipally digested sewage sludge, and even naturally occurring geologic materials which may have high concentrations of nitrates. All of these sources may contribute to the problem of nitrate in groundwater. Frequently, agriculture is not the source of nitrate-contaminated groundwater.

The U. S. Public Health Service and U. S. Environmental Protection Agency have established a drinking water standard of 10 ppm nitrate nitrogen as the maximum allowable level for public water systems. This standard is applicable to systems which have 15 connections and serve more than 25 persons and was based on the best information available to the Public Health Service, the EPA and other agencies. However, some people feel that even 10 ppm nitrate nitrogen poses a health hazard, especially to infants.

Infants (under six months of age) are susceptible to a condition referred to as methemoglobinemia, sometimes called the blue baby syndrome. This condition is exemplified when, because of nitrate being converted to nitrite after ingestion, the blood is unable to carry sufficient oxygen to individual body cells. This condition, however, has never been documented in Utah and only very rarely in the U.S. Adults can tolerate considerably higher nitrate levels than infants, with no deleterious effects. In fact, 25 ppm is the European standard. Nevertheless, if your particular water supply has levels higher than 10 ppm it is suggested that you use an alternative water source, especially for infant formula and food preparation.