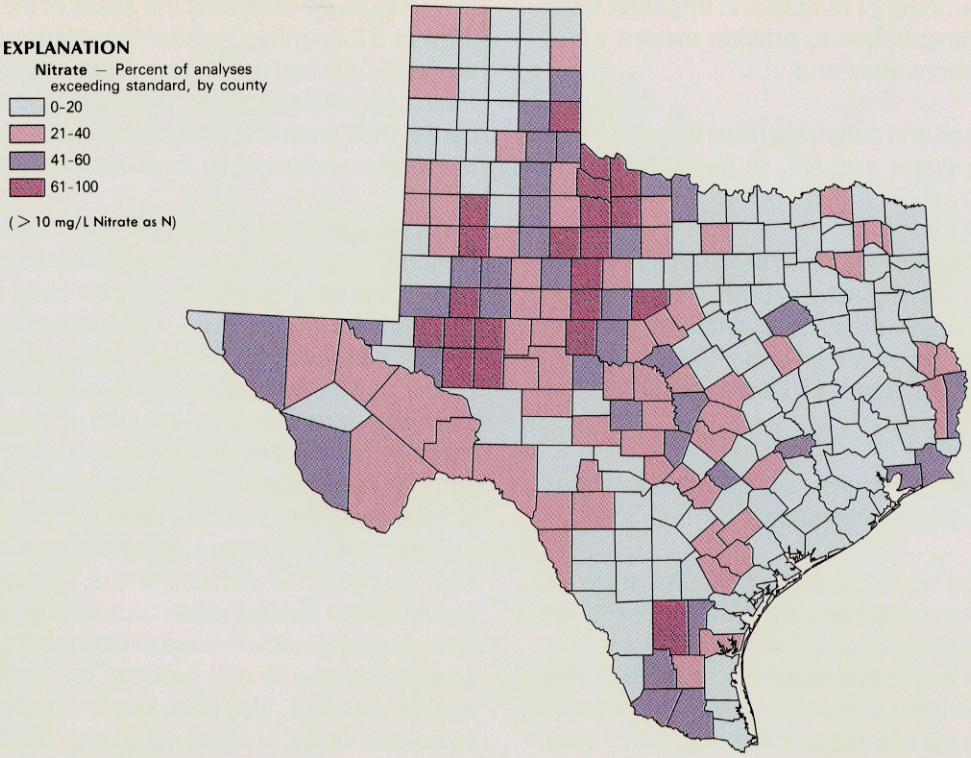

Figure 49.—Distribution of Analyses, by County, That Exceed U.S. Environmental Protection Agency National Drinking-Water Standards for Nitrate (>10 mg/L Nitrate as N) (Strause, 1987 From Texas Water Commission Files)

During the period from June 1, 1984 through May 31, 1985, Texas agricultural producers intentionally added 3,081,694 tons of all types of fertilizers to their fields (Texas Agricultural Statistics Service, 1985). To those concerned with environmental impacts, this seems to be an excessive use of chemicals and an obvious source of nitrogen contamination of ground water. Fortunately, chemical, physical, and biological processes occurring at or near the earth's surface neutralize most of the effect of using these large volumes of nitrogen fertilizers (Johnson, 1988).

The role of the soil profile in governing the behavior of a chemical contaminant has previously been discussed and will not be repeated here. The discussion which follows is applicable to nitrates.

The reaction known as reduction or denitrification is the only control of nitrate in the soil profile. Nitrate denitrification is a naturally occurring reaction in which nitrate is reduced, by bacteria, to harmless gases. This process has been shown to occur in shallow water-table aquifers underlying agricultural lands. This reaction prevents nitrates from polluting deeper aquifer systems. In areas where this reaction is not occurring, nitrate will persist and ground-water pollution is possible (Hendry, 1988). This is particularly true in areas in the vicinity of dense septic tanks and/or underlying highly fertilized agricultural areas.

Research in other states has shown that crops use only about 50 to 70 percent of fertilizer nitrogen applied (Johnson, 1988). When sufficient mineral nitrogen exists in the soil to support crop and microbial requirements, the excess is present in the soil profile as nitrate. In this form, it is a highly mobile potential pollutant since it does not adsorb on particles nor does it precipitate as a mineral (Hendry, 1988). Because of these attributes, as water moves through the soil, nitrate is subject to movement with water. However, there are factors which determine if nitrates derived from fertilizers or other sources are leached to the water table. These are:

(1) $N0_3$ must be present in the soil in excess of that which can be utilized by soil microorganisms and/or the crop in the existing environment;