


 University of Idaho
 Cooperative Extension System

Idaho Wellhead Sampling Program

Nitrate Sampling

**ELMORE AND EASTERN
 OWYHEE COUNTIES
 NOVEMBER 1992**

College of Agriculture

[Next Page ▶](#)
[◀ Prev Page](#)
[Page Top ▲](#)
[WQ Home ▲](#)
[Ag Home ▲](#)
[UI Home ▲](#)

Water Quality

Water is the lifeblood of Idaho! Idaho ranks second in the United States in water use, only to California. Our traditional industries such as agriculture, forestry, and mining are all water dependent. And a large portion of tourist revenues in Idaho are tied to attractions with water. In addition to the economy, high quality water is essential to Idaho's recreational opportunities and wildlands. We must protect water quality to maintain our high standard of living and uniquely rich quality of life in Idaho.

Over 90 percent of Idahoans rely on groundwater for their drinking water. Surveys in Idaho have generally shown that groundwater quality is not a widespread problem.

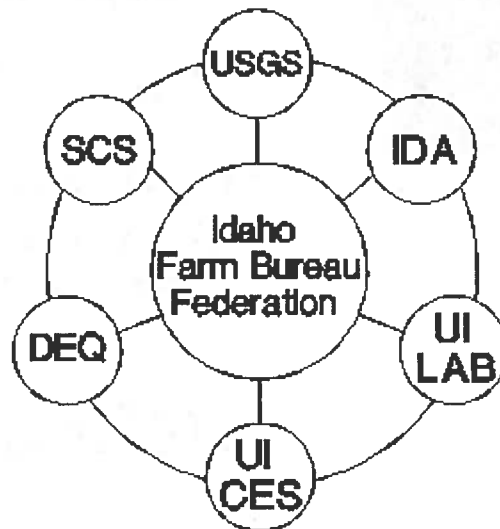
The Program

The Idaho Private Wellhead Sampling Program was initiated and coordinated by the Idaho Farm Bureau Federation (IFB). Coordinator Jim Yost, Idaho Farm Bureau Federation's public affairs director, in conjunction with the Elmore County Farm Bureau, collected 250 private wellhead samples from farmers and rural residents on November 20, 1992.

This program was truly a cooperative effort as five different government agencies and the Idaho Farm Bureau Federation, a private membership-oriented organization, united to make the program a success. The Idaho Department of Agriculture (IDA), Soil Conservation Service (SCS), and the

University of Idaho Cooperative Extension System (UI CES) assisted with program logistics, sample bottle distribution, and dissemination of information. The University of Idaho College of Agriculture's Analytical Laboratory (UI LAB) had major roles in planning and designing the quality assurance phase of the analytical part of the program and analyzed all samples for nitrates. The Idaho Division of Environmental Quality (DEQ) designed the quality assurance plan for the field effort, the questionnaire, and sampling procedures for the public. The United States Geological Survey (USGS) assisted with the collection of samples for quality assurance.

A cooperative effort . . .



Why Conduct This Program in Elmore and Owyhee Counties?

Groundwater monitoring surveys across the U.S. have shown that agrichemicals such as nitrogen fertilizers are contaminating many sources of groundwater. Surveys in Idaho show that nitrates are being found in several major aquifers. Over 90 percent of the 29,000 residents of Elmore and Owyhee counties obtain their drinking water from groundwater. Over 500 farms are found in Elmore and eastern Owyhee counties. Over 85 percent of the farmers in the area who attended a water quality workshop in 1992 viewed water as an essential resource to both their personal and business lives.

Growers in these two counties encouraged this wellhead sampling program for nitrates because of the following reasons:

- Observations that some wellheads are not constructed properly -- causing a danger of contaminants being directly transferred into the groundwater.
- Both shallow and deep aquifers exist in the two-county area.
- Intensive and extensive N fertilizer use on irrigated acreage.
- No baseline wellhead data exists to determine trends or to evaluate the need for BMPs.
- A large quantity of septic tanks in rural areas that are susceptible to flooding.

The Sampling

Date: November 20, 1992

Samples collected:

Rural residents	250
Blind/controls	69

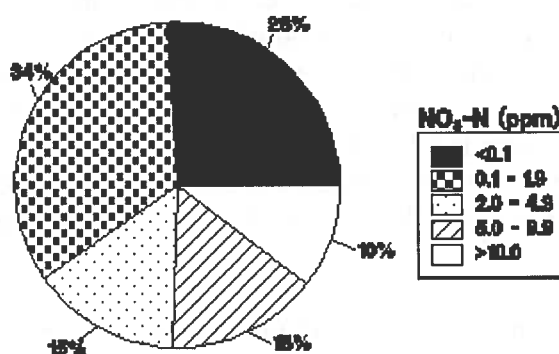
Total

319

Sampling Results

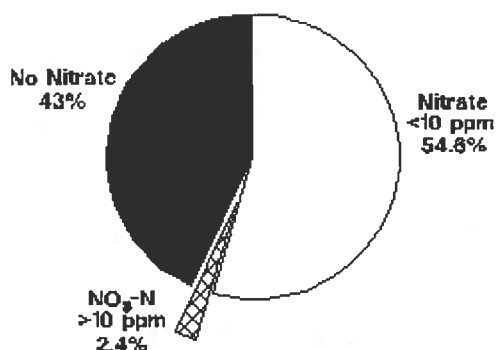
Ten percent of the sampled wells in Elmore and eastern Owyhee counties contained nitrate-N levels greater than 10 ppm, which is the National Public Health Service drinking water standard. Sixty percent of the sampled wells contained less than 2.0 ppm nitrate-N.

Elmore and Owyhee Counties, 1992



Compared to the EPA's National Survey for nitrates conducted in 1988 a higher percentage of wells in Elmore and eastern Owyhee counties exceed the Federal Health Standard for nitrates than the national average. In the EPA survey 2.4 percent of rural domestic wells contained nitrate levels exceeding federal health standards (10 ppm NO₃-N). Another 30 percent of rural domestic wells contained detectable levels of nitrates. On a national level EPA estimates that about 250,000 rural wells exceed National Public Health Standards for NO₃-N.

EPA National Nitrate Survey, 1988



What Do the Sampling Results Mean?

This study shows that:

- 10 percent of sampled wells do not contain excessive levels of nitrate based on Public Health Drinking Water Standards.
- 60 percent of sampled wells contain less than 2 ppm NO₃-N.
- 30 percent of sampled wells contain between 2 and 10 ppm NO₃-N.
- 10 percent of sampled wells contain more than 10 ppm NO₃-N.

A greater percentage of wells in this survey exceed the Federal Health Standard for nitrates than the other 12 Idaho counties (Ada, Benewah, Bonner, Bonneville, Canyon, Cassia, Gem, Jerome, Latah, Minidoka, Payette, and Twin Falls) sampled to date. However, the high nitrate levels appear to be confined to a local geographic area within the two counties.

The wells containing less than 2.0 ppm NO₃-N are in very good shape. There is no reason to believe that man-induced practices are adding nitrates to groundwater in these areas since low levels of nitrates (1 to 2 ppm) may be natural in some aquifers.

The 30 percent of sampled wells that contained between 2 and 10 ppm NO₃-N should be checked again in 2 to 3 years. Although these wells meet federal nitrate drinking water standards, it is probable that human activity has introduced nitrate into water in the vicinity of these wells since detected NO₃-N levels are greater than normal, natural nitrate values in aquifers. Nitrogen fertilizer is the likely source of the elevated nitrogen levels in the groundwater; however, animal wastes, septic systems, and plant residues may also be responsible for the elevated nitrate-N values. Changes in the management of nitrogen fertilization may be warranted in certain situations.

Nitrate and Groundwater

One potential groundwater contaminant is nitrate (NO₃). Humans ingest nitrate in food and water. In older children and adults, nitrate is ingested, absorbed from the digestive tract, and excreted rapidly in the urine. Healthy human adults can consume fairly large amounts of nitrate with no short-term adverse effects. The health effects of chronic, long-term consumptions of high levels of nitrate are uncertain.

Infants younger than 6 months are believed to be susceptible to nitrate poisoning. Bacteria present in their digestive systems at birth can change nitrate to toxic nitrite (NO₂). Newborn infants have little acid in their digestive tracts, and they depend on these bacteria to help digest food. Generally, by the time infants reach 6 months, hydrochloric acid levels increase in their stomachs and kill most of the bacteria that convert nitrate to nitrite.

Once formed, the nitrite is absorbed and enters the bloodstream. There it reacts with the oxygen-carrying hemoglobin to form a new compound called "methemoglobin." This compound interferes with the blood's ability to carry oxygen. As oxygen levels decrease, babies may show signs of suffocation. This condition is called "methemoglobinemia."

The major symptom of methemoglobinemia is bluish skin color, most noticeably around the eyes and mouth.

Infant deaths from methemoglobinemia, sometimes called "blue baby syndrome," are rare. Some documented deaths have been linked to high levels of nitrate in well water. Doctors now recommend using bottled water to make formula when nitrate levels exceed the U.S. Public Health Service drinking water standard of 10 parts per million (ppm) NO₃-N.

Quality Assurance

Quality control in this sampling project was the top priority. Blind spiked samples and blanks were randomly dispersed with farmer-provided samples to assure top quality. In addition, in some cases, duplicate farm wellhead samples were included. Over 50 quality control samples were part of this study.

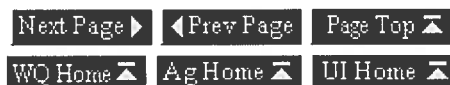
Nitrates were determined on water samples by the University of Idaho College of Agriculture's Analytical Laboratory in Moscow. After collection, a preservative was added to the sample before shipment to Moscow. Samples were run in the laboratory within 72 hours after collection. The most modern analytical techniques and equipment were used in this operation. A high degree of confidence should be placed on the numbers obtained from these samples.



The University of Idaho Cooperative Extension System has over 140 faculty strategically located throughout the state, including 84 agricultural agents and home economists stationed in 42 of 44 counties. In addition, faculty (specialists) are located on campus in Moscow and at research and extension centers in Aberdeen, Caldwell, Idaho Falls, Kimberly, Parma, Sandpoint, Teton, and Twin Falls.

This brochure, WQ-16, was prepared by R. L. Mahler, M. Seyedbagheri, and K. A. Mahler, Soil Science Division, University of Idaho, Moscow, Idaho 83844. Seyedbagheri is an agricultural extension agent in Elmore County, stationed in Mountain Home.

1,500, 1-93



Comments to author: kloeffelman@uidaho.edu

All contents copyright © 1996.
College of Agriculture, University of Idaho.
All rights reserved.

Revised: June 1, 1996

URL: http://www.uidaho.edu/ag/sg/sg_wqbr16.html

