GROUNDWATER SURVEY REPORT

by
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The "State of Our Groundwater" maps and report were prepared as a joint project between Washington State University and the Washington Toxics Coalition. The objectives of the project are to:

1) Provide a broad picture of groundwater quality and contamination in Washington.

2) Describe the current state of groundwater monitoring in Washington.

3) Give examples of groundwater protection programs and describe where further efforts are needed to protect groundwater.

The authors have interpreted the results of the project as showing needs for increased efforts to prevent groundwater degradation, and improved statewide groundwater monitoring.

Description of database:

The database used to prepare the maps was derived from data from the Washington State Department of Ecology, the Washington State Department of Health (DOH), the US Geological Survey, and several local studies. The database includes data collected between 1985 and 1993. Data were organized differently in each source, making some comparisons difficult. The quality and ease of interpretation of data also vary among sources. Some specific areas of the state have been sampled intensively for a range of contaminants, while other areas have had little sampling. None of the data sets are a random, representative sampling of the state. Further, the picture changes with time, with contaminants appearing in wells at some times, but not at other times, for these reasons, the maps are database paint only a broad picture of groundwater contamination in the state.

For these maps, contamination by nitrate and metals is defined as levels greater than one half the drinking water standard (except for metals contamination at waste sites, where concentration data was not available).

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Contamination by synthetic organic compounds (pesticides, petroleum products, volatile organic compounds, and other organics) is defined as any detectable level. Thus, contamination includes levels both greater than and less than drinking water standards. The maps include concentrations less than drinking water standards for three reasons. First, they indicate vulnerability of groundwater to human activity, and show areas where groundwater protection can be improved. Second, the Washington state groundwater regulations are designed to prevent degradation before contaminant levels exceed drinking water standards. Third, Washington residents place high value on their groundwater and expect it to be as clean as possible.

The maps do not include two important types of human-caused groundwater contamination - seawater intrusion and microbial contamination. Sea water intrusion is confined to immediate coastal areas. Microbial contaminants cause acute illness, but they don't persist as long as most chemical contaminants, making them difficult to depict on a map. The maps also do not include contamination by certain metals, such as iron and manganese. This contamination is mostly natural, and the effects of these metals on water quality is largely aesthetic. Finally, the maps do not include contamination by radioactive compounds. Radioactive compounds in groundwater are often of natural origin, but human-caused contamination exceeds drinking water standards over a large area at the Hanford nuclear site.

The database includes approximately 10,000 wells sampled for nitrate (6,500 in the DOH drinking water wells network), 3,600 wells sampled for metals, 2,600 wells sampled for volatile organic compounds (VOCs), 600 wells sampled for pesticides (focused mostly on area where pesticide leaching is most likely), 1,200 hazardous waste clean-up site, and 1,600 leaking underground storage tank sites. Some of the wells were sampled many times between 1985 and 1993, while other were sampled only once or a few times. Many of the wells in the nitrate database are also in the metals and VOC databases. The pesticide database covers only a small part of the state, but will be significantly expanded by early 1995 when DOH releases a statistical study of 1,400 drinking water wells. DOH is also expanding its database for VOCs.

Summary of results:

This study identified approximately 2,700 wells, sites, or well-dependent water systems that have been contaminated at some time since 1985, including some with multiple contaminants:

Contaminant	Number of wells, sites, and systems
Nitrate	1183
Petroleum products	822
Other organics	612
Metals/trace elements	200
Pesticides	176

These numbers represent documented sites of contamination that were accessible to us through public agencies. Because of the limitations described above, they give only a rough and incomplete picture of groundwater contamination in the state.

Despite the limitations of the database, the maps do show that groundwater contamination is widespread in Washington. While levels of contamination are generally low, and the majority of wells contain no contaminants, enough exceptions exist to cause concern. The overall picture of groundwater quality in Washington is not a cause for alarm, but it is a long-term problem, requiring a sustained focus on prevention.

Some efforts are already underway to prevent further groundwater contamination in Washington. Among these are:

Replacement and clean-up of leaking underground storage tanks.

Reduced use and increased recovery of toxic materials in some industries.

Development of improved pest management, fertilizer use, and animal waste management practices in agriculture.

Recommendations:

The best way to protect groundwater is to prevent problems at the source. To promote prevention:

Washington needs a coordinated, statistically-based groundwater database to improve our knowledge of current groundwater quality, and track long-term contamination trends.

We need improved knowledge of how to protect groundwater, and greater adoption of what we already know. We need widespread education, targeted research, better interagency coordination, and improved incentives and regulations that focus on prevention for homes, businesses, government, and farms.

Implications for agriculture:

Agricultural practices can contribute nitrate and pesticides to groundwater. While agriculture is not the only source of these contaminants, it is an important source. We know that occurrences of nitrate at levels above drinking water standards are most common in the Columbia basin. We know much less about pesticides, because the database is small and localized. A new, statewide, statistically based sampling of 1,400 wells done by the DOH will increase our knowledge about pesticides in groundwater.

In my opinion, preventing pesticide leaching into groundwater will be less difficult than preventing nitrate leaching. The future of pest management is an Integrated Pest Management (IPM) approach. Because of the ecological base of IPM, pesticides used will often have lower leaching potential, and pesticide use will be more efficiently targeted, resulting in decreased leaching risk, IPM programs can be developed with decreased leaching as one goal.

Preventing nitrate leaching will be approached in two ways. The first involves improving the efficiency of fertilizer, manure, and irrigation management to reduce leaching potential. The second is including reduced leaching as a basic part of a "sustainable agriculture" program. Because of the high solubility of nitrate, even the most careful management is unlikely to eliminate nitrate leaching.

Whether we are growing crops, consulting, selling fertilizer and equipment, doing research, or working on conservation programs, we all can play a role in protecting groundwater, by developing, testing, and adopting feasible ways to reduce leaching at the source.