Minnesota Pollution Control Agency

# Ground water quality in Cottage Grove, Minnesota

May 2000

Environmental Outcomes Division

Ground Water Monitoring & Assessment Program

In 1999, the Ground Water Monitoring and Assessment Program (GWMAP) of the Minnesota Pollution Control Agency (MPCA) sampled 79 private wells and four monitoring wells in Cottage Grove, in eastern Minnesota. No municipal wells were used in this study. We conducted this study to better understand the distribution of nitrate and other chemicals in ground water and to identify factors affecting ground water quality.

## Why was the study undertaken in Cottage Grove?

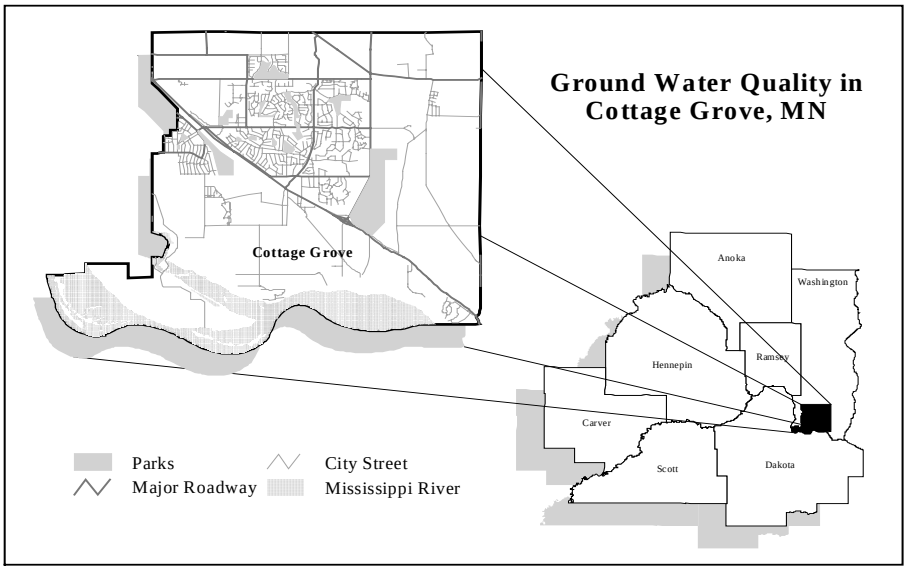
Cottage Grove is a mixed rural and urban area that has experienced urban growth over the past 20 years. These changes in land use continue today. Sampling of private wells indicates nitrate impacts to the Prairie du Chien and Jordan aquifers that underlie the city. These aquifers are an important source of drinking water.

## Study description

The map below shows the location of the study area. We collected samples for nitrate and other inorganic chemicals (including trace elements), volatile organic compounds (VOCs), herbicides and tritium (an indicator of the age of the water). Sampling procedures are described in Minnesota Pollution Control Agency (1998).

## What did we find?

- The overall median nitrate concentration was 5.3 mg/l, with 17 percent of the samples exceeding the drinking water standard of 10 mg/l.

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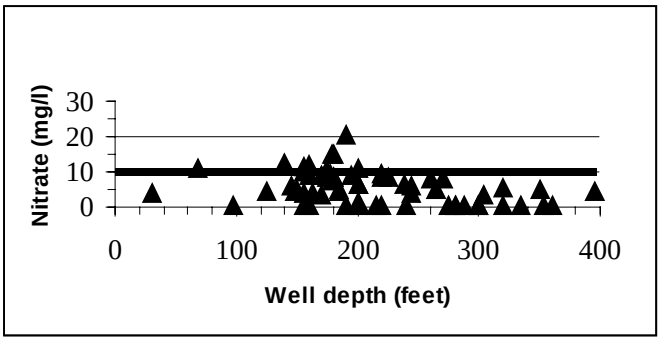
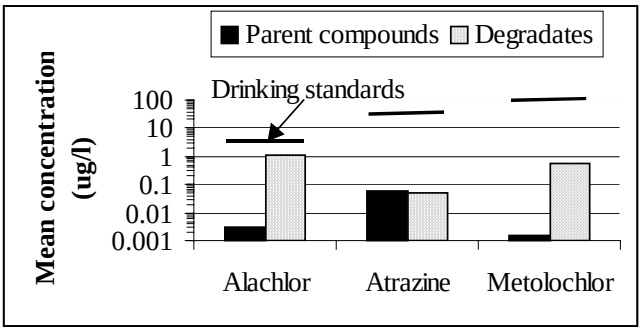
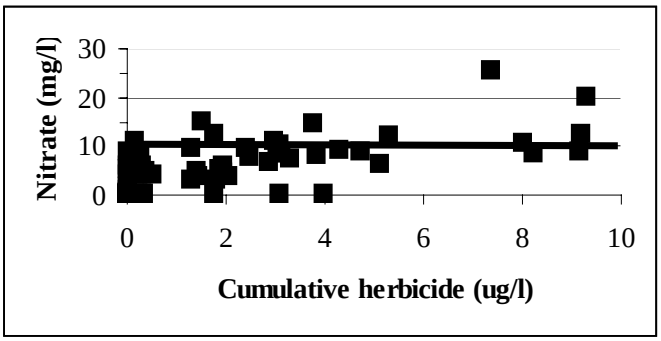
- Nitrate was present deeper in ground water, with concentrations decreasing slightly with depth. (For more information on nitrate and its health effects, see the Minnesota Department of Health fact sheet, *Nitrate in Drinking Water: Health Concerns*.)




- Nitrate concentrations were similar in the Prairie du Chien (5.6 mg/l) and Jordan (5.8 mg/l) aquifers.
- Herbicides and their breakdown products were detected in 68 percent of the domestic wells. Breakdown products accounted for about 95 percent of the total herbicide mass detected in ground water samples. Concentrations were typically well below drinking water criteria.




- As concentrations of herbicide in a well increased, concentrations of nitrate increased. This suggests agricultural sources for much of the nitrate in the study area.




- Dichlorodifluoromethane (Freon 12) was the only VOC detected. It was found in two wells at concentrations of 0.8 and 1.2 µg/l. The drinking water standard is 1,000 µg/l.
- There was no correlation between concentrations of nitrate or herbicide and well depth, thickness of overlying sand, age of ground water, or land use. The lack of a correlation with land use may reflect historic inputs of nitrate and herbicide from agriculture in areas that are now residential.
- Nitrate and herbicides introduced into these aquifers are persistent. With the existing data, which were limited, we did not find evidence of an increasing or decreasing trend in nitrate concentration in ground water.

## What's next?

Impacts from changes in land use may take many years to detect. Long-term monitoring should be established in the Prairie du Chien and Jordan aquifers to determine whether water quality is changing, particularly in response to changes in land use. Ground water modeling can improve our understanding of trends in water quality. The primary benefit of modeling is as a tool to predict changes in water quality under different development scenarios.

Results from this study illustrate the importance of managing human activities at the land surface in areas underlain by unconfined Paleozoic bedrock aquifers. It is important to minimize contamination from activities at the land surface. Additional studies in similar hydrogeologic settings are warranted.

## References

Minnesota Department of Health. 1996. *Nitrate in Drinking Water: Health Concerns.*

Minnesota Pollution Control Agency. 1998. *GWMAP Field Guidance Manual.*

### For more information

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