

INTERAGENCY COOPERATION TO IMPROVE NITROGEN MANAGEMENT FOR WATER QUALITY PROTECTION

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ABSTRACT

Agriculture and water are inseparable in a semiarid region such as Colorado. Adequate clean water supplies for drinking, agriculture, industry, and recreation are critical for the lifestyle Coloradans enjoy. The Agricultural Chemicals and Groundwater Protection Program (ACGPP) was created by the Colorado legislature in 1990. The purpose of this unique program is to reduce the potential impairment of groundwater by agricultural chemicals have on groundwater and the environment by preventing groundwater contamination before it occurs through improved agricultural chemical management. Agricultural chemicals covered under this legislation include commercial fertilizers and all pesticides. The ACGPP is funded by a 50-cent per ton tax on fertilizer sales and an annual \$40 per product fee for pesticides registered in the state.

The ACGPP employs three primary functions to protect groundwater in Colorado:

1. Regulation;
2. Groundwater monitoring; and
3. Education and training for Best Management Practices (BMP).

REGULATION AND PROGRAM OVERSIGHT

The Colorado Department of Agriculture (CDA) is the program's lead agency and responsible for regulatory aspects of the program. One of the CDA's responsibilities is to regulate bulk agricultural chemical storage and mixing and loading. Since facility inspections began in 1997 more than 2,000 inspections have been performed at facilities throughout the state. Containment is required for liquid fertilizer storage greater than 5,000 gallons and pesticide storage greater than 55 gallons. When secondary containment is necessary, a mixing/loading area is also required. Additionally, when 500 gallons or more of liquid formulated product are mixed or loaded in any one year period a mixing/loading area is also required. These rules for pesticides are more stringent than those required by the US Environmental Protection Agency (USEPA).

The CDA also has the authority through the Commissioner of Agriculture to declare an Agricultural Management Area (AMA) if monitoring reveals that groundwater in a defined area is impaired due to improper use of fertilizer or pesticides. The AMA could also be The AMA could require an Agricultural Management Plan (AMP) to be implemented. However, how the AMP is enacted is not specified by rule or law. The rules for an AMP could be as stringent as prohibiting use or limiting rates or simply increasing BMP training and education. If the AMA and/or AMP are not effective in preventing or mitigating groundwater impairment, the Water Quality Control Commission (WQCC) with the Colorado Department of Public Health and Environment (CDPHE)

can promulgate a more serious regulatory control response. To date, groundwater monitoring has not revealed that an AMA is necessary to protect water quality and the environment.

GROUNDWATER MONITORING

The monitoring program has prioritized its sampling in basins where agriculture predominates and rural homes utilize groundwater. These data form the backbone of the ACGPP. They determine the need and priority for education and other program resources. The program has completed sampling of groundwater systems in the largest agricultural and urban regions of Colorado. The CDA conducts the monitoring program and the CDPHE analyzes and interprets the data. All the data is housed in a publically available, online database and map viewer (https://erams.com/co_groundwater/).

Monitoring data and groundwater vulnerability assessments indicate there are areas in Colorado where water quality is susceptible to contamination. For example, approximately 26% of over 1,282 wells sampled exceed the USEPA drinking water standard of 10 mg L⁻¹ NO₃-N. The majority of the impaired areas are in highly vulnerable groundwater in the S. Platte River. Isotopic analyses of the Weld County portion of this area revealed that organic sources of nitrogen such as manure and sewage make up a larger share of the high nitrate groundwater than commercial fertilizer. Overall, the trend in NO₃-N in this groundwater network is downward with individual wells trending upward, downward, or no trend.

EDUCATION AND TRAINING

The legislative act creating the ACGPP specifies that Colorado State University Extension (CSUE) provide education and training on how to reduce groundwater contamination from agricultural chemicals. The CSUE has produced numerous publications on BMPs, and helped pilot the local BMP development process around the state. A particular focused effort is targeted at the most impaired groundwater, such as the S. Platte River Valley.

CSUE uses other avenues to provide information, such as applied research; field days; demonstration sites; continuing education through the Certified Crop Advisor program; a display booth; videos; and online tools and Apps which are housed on the Groundwater Protection Program Web site (waterquality.colostate.edu).

In order to assess the BMPs adopted by Colorado's agricultural producers, surveys were conducted in the winters of 1997, 2001, and 2011. Overall, results of the three surveys suggest that producers accept many of the irrigation, pesticide, and nutrient management BMPs that help protect water quality and farm profitability. Nutrient and pesticide management BMP adoption is generally higher than irrigation management BMPs. Irrigation system improvements, or structural BMPs, are common in most regions, but adoption of irrigation management BMPs used to determine when and how much to water is not as common.

FUTURE DIRECTION

Predictions are that population growth and urbanization, coupled with increasing land and water values, will reduce the number of acres devoted to irrigated crop production in several river basins. These trends may also change cropping patterns from large acreage, low value crops to smaller acres of higher value crops. Often, these crops require different levels of pesticide and fertilizer inputs.

Like much of the West, Colorado is experiencing an increase of small acreage 'ranchettes' as larger farms and ranches are subdivided. The result is that one landowner may be replaced by

many more individuals on the same land area. These land use changes may also affect ACGPP activities and resources as the new rural residents also impact water resources through their land management activities. Thus, changes in educational and monitoring efforts will be required to protect groundwater quality under these new land use environments.

Additionally, the increasing and changing population dynamics in Colorado may refocus the educational and monitoring programs from primarily agricultural to urban and exurban areas. Keeping partnerships with federal, state, and other agencies working in water resource protection will continue to be critical, but other partners also may need to be considered, such as municipalities, the green industry, and other entities that work more in the urban environment.

The Groundwater Protection Program has been working with agricultural producers, the agricultural chemical industry, and several state and federal agencies to prevent contamination of Colorado's groundwater resources from point and non-point source pollution for more than two decades. This cooperation serves a good model for other programs working to protect Colorado's water for future generations. BMP adoption results and groundwater monitoring data indicate these efforts are working in most areas to protect groundwater quality in Colorado.

REFERENCES

Bauder, T., R. Waskom, R. Wawrzynski, K. Mauch, E. Wardle, and A. Ross. 2012. Agricultural Chemicals and Groundwater Protection in Colorado. Colorado Water Institute Special Report No. 23.