REPORT TO THE GENERAL ASSEMBLY STATE OF COLORADO

STATUS OF IMPLEMENTATION OF SENATE BILL 90-126, THE AGRICULTURAL CHEMICALS AND GROUNDWATER PROTECTION ACT

Submitted by Thomas A. Kourlis
Commissioner
Colorado Department of Agriculture
December 31, 1994

Report to the General Assembly of the State of Colorado

Status of Implementation of Senate Bill 90-126, the Agricultural Chemicals and Groundwater Protection Act

In accordance with Title 25 Article 8 Section 205.5 (9), C.R.S. (1993 Supp.), the following report of the progress made in implementing the provisions of the Agricultural Chemicals and Groundwater Protection Act ("Act") is hereby provided. This report reflects progress made since the last report, dated December 31, 1993.

In the report to the Legislature dated December 31, 1993, several goals for 1994 were identified by the cooperating agencies. The progress made toward each of the goals is detailed in the following pages.

Memoranda of Understanding

Memoranda of Understanding as provided in Section 25-8-205.5 (3)(f) and (g) of the Act have been signed for fiscal year 1994/95 between the Colorado Department of Agriculture and: 1) Colorado State University Cooperative Extension, 2) the Colorado Department of Public Health and Environment. The objectives for 1994/1995 for this program are stated on pages 6 and 7.

Education and Communication

In order to keep the advisory committee and interested organizations informed of activities concerning the program a newsletter is published. Also, fact sheets are prepared to provide information on the program and are being distributed at meetings, conferences and trade shows (Appendix I). A display board is being utilized at conferences and trade shows to provide information on the program. A short video entitled Protecting Colorado's Groundwater is available to inform the general public on

groundwater quality, agricultural chemicals and the Act. This video may be borrowed from the Department of Agriculture or copies may be purchased from the CSU bulletin room. Information on the program is continually being presented to the public through radio shows, mass media, press releases and at presentations at meetings throughout the state.

Best Management Practices

Best Management Practices (BMPs) are being developed at the user level through extensive local input. A general BMP notebook for Colorado Agriculture is being developed which consists of eight subject specific BMP chapters and one booklet providing an overview of the BMP process. Six of the chapters were completed and published this year and are available through the CSU Bulletin Room. The three remaining chapters will be available by early 1995. The completed notebook will be provided to pesticide and fertilizer dealers, CSU Cooperative Extension offices, and all Soil Conservation Service offices. They will also be available through the CSU Bulletin Room.

The statewide notebook is being utilized to guide the local work groups through the BMP development process for regionally specific BMPs. The San Luis Valley and the South Platte River Basin from Denver to the Nebraska state line have been identified as the first two priorities for this localized BMP development. A booklet entitled Best Management Practices for Nutrient and Irrigation Management in the San Luis Valley has been completed and published in cooperation with the USDA Water Quality Demonstration Project. This group is now developing pesticide management BMPs for the San Luis Valley. Localized BMPs for the Front Range/South Platte area are in progress. A document entitled Best Management Practices for Irrigated Agriculture was published this summer using this group's efforts. Both BMP publications are available upon request (Appendix II).

Demonstration Sites and Field Days

Seven (7) fields in the South Platte River Valley were selected and used to demonstrate improved nitrogen management techniques in irrigated corn. A field day toured several of these sites in order to demonstrate BMPs to producers. Demonstration plots and field days will be continued in the South Platte River Basin in 1995 and will be initiated in the San Luis Valley. In the future, locations for these plots will be expanded to other regions of the state and will focus on additional crops (Appendix II).

Groundwater Monitoring

In 1994, approximately 150 wells in the Arkansas River basin were sampled and analyzed for agricultural chemicals. Results from these samples are being analyzed. Based on these results of the analyses, follow-up monitoring in the Arkansas River basin may be performed in 1995. Also monitoring will be performed in urban areas along the front range in 1995.

A detailed report of the groundwater monitoring that took place in 1992 and 1993 in the South Platte alluvial aquifer was published in early 1994. It is available from CDA. Data is being compiled from the San Luis Valley monitoring that took place in 1993 and a report will be published in early 1995.

All of the groundwater sampling is closely coordinated with extension agents, water conservancy districts, other agencies, and local and county officials. Many of these agencies have groundwater monitoring projects analyzing for at least one agricultural chemical, usually nitrate.

One goal of the monitoring program as stated in the long range sampling plan (Appendix III) is to have a permanent state wide well monitoring network that can be used to gather long term data. The U.S. Geological Survey is currently drilling numerous monitoring wells throughout the state as part of the National Water Quality Assessment. These wells will form a substantial basis for the Agricultural Chemicals and Groundwater Protection program monitoring network. The USGS has indicated they would like this program to take over ownership of some of these wells that local agencies such as water conservancy districts have not claimed. The USGS will be forced to abandon the wells and plug them if they remain unclaimed. This is an excellent opportunity to establish a large part of the monitoring network. CDA, CDPHE and CSU are currently trying to determine if taking over ownership of these wells is legally possible and what liability might be incurred in doing so.

The aquifer vulnerability model developed by CSU to assess groundwater vulnerability to agricultural chemicals is being field tested in the San Luis Valley. If proven effective, the model will be used to assist in prioritizing areas for groundwater monitoring and BMP development (Appendix III).

Groundwater Data Management System

The collection, evaluation and entering of existing groundwater quality data from all available sources is ongoing. The data that is currently available has been or is in the process of being entered into the groundwater quality database at the Department of Public Health and Environment. Other data has been generated, however it remains unavailable due to concerns about privacy and future use of the data (Appendix III).

Advisory Committee

The advisory committee continues to be an integral part of the implementation of this program by providing input from the many facets of the agricultural community and the general public that they represent (Appendix V). The committee met three times during 1994. The majority of the time was spent reviewing and revising the statewide BMP chapters. The committee provided extensive input into the wording of the rules and regulations for bulk storage facilities and mixing and loading areas as well as numerous other issues.

Coordination

Coordination with other projects and programs relating to agricultural chemicals and groundwater is an essential part of the implementation of the program. All three agencies work continually to keep abreast of other programs both governmental and private so information can be incorporated into the implementation of the Act as well this programs information passed on to other agencies and organizations. Input is sought in all phases of the implementation of this program to avoid duplication of efforts, costs, conflict or duplication of regulation and to insure decisions are made with the most complete knowledge available.

Storage Regulations

The rules and regulations as required in section 25-8-205.5 (3) (b) were proposed to and adopted by the Commissioner of Agriculture in July and became effective September 30, 1994. The regulations will now be phased in with pesticide facilities required to be in compliance by September, 1997 and fertilizer facilities by September 1999 (Appendix IV).

Prior to adoption, the proposed rules and regulations were presented in January and February at public hearings in Alamosa (21

attended), Grand Junction (7 attended), Lakewood (30 attended), Lamar (28 attended) and Sterling (24 attended) in order to receive public input. Written comments were received from six individuals.

The program continues to stay abreast of information concerning the development of federal regulations in order to prevent a conflict with regulations that will eventually be enacted at the national level (Appendix V). Comments on the federally proposed Standards for Pesticide Containers and Containment were formulated with the help of the advisory committee and submitted to the EPA.

Major Issues

Recently, current funding levels have been identified as being insufficient to meet the increasing demands of the education and groundwater monitoring portions of the program. The educational component has generated tremendous interest by local groups to develop localized best management practices for pesticide and fertilizer use. It is important to try and meet these needs while interest is high and people are wanting to address this issue. Currently the one staff person is unable to sufficiently meet the demands of all of these groups. Also, in order to determine whether there is seasonality in groundwater quality and to better utilize the groundwater laboratory, samples need to be taken throughout the course of the year. This will require an increase in operating funds for CDPHE. Monitoring is critical to determine if the groundwater is being impacted by pesticides or fertilizers. The sampling results in the long term will help determine if the voluntary best management practices are effective in improving groundwater quality.

EPA is developing a proposal which would require states to produce management plans for pesticides thought to be a significant groundwater hazard. If a state wants to allow continued use of any of the pesticides identified, it must produce an EPA-approved management plan specific to that product. A generic plan is being drafted that can be adapted to different chemicals once EPA formally identifies these pesticides. The development of this plan to meet EPA guidelines is becoming increasingly complicated and time consuming. The flexibility initially developed in the program to allow States to make site specific decisions to address detections of pesticides in groundwater seems to be vanishing. EPA is attempting to dictate the responses to a large extent. This EPA program as it is currently drafted, will either be so resource intensive that it will be prohibitive for this state to continue the use of the identified pesticides or it will require all of the program funds just to deal with this one issue (Appendix IV).

Objectives for 1995 Determined

The following objectives for 1995 have been established:

- Continue the development of localized BMPs for irrigated crops in the South Platte River Basin;
- Complete development of the localized Pesticide Use BMPs in the San Luis Valley for the major crop rotation patterns;
- Complete the production of a general BMP notebook for Colorado Agriculture;
- Coordinate an interagency field day to deal with water quality issues in the South Platte River Basin;
- Continue demonstration plots in the South Platte River area for displaying improved nitrogen and water management to farmers;
- Start demonstration plots in the San Luis Valley;
- Continue developing educational resource materials for groundwater education particularly for urban uses to encourage improved agricultural chemical and water management;
- Begin Urban BMPs;
- Continue to hold in-service training for chemical applicators, agency personnel, etc.;
- Participate in the implementation of the Certified Crop Advisor program;
- Develop and provide generic plans for secondary containment and mixing and loading pads;
- Provide information and training on the containment rules and regulations;
- Complete the report of the 93 groundwater samples taken in the San Luis Valley;

- Complete the analysis and report of the 150 groundwater samples taken Arkansas River Basin;
- Perform follow up sampling at sites in the Arkansas River Basin;
- Collect and analyze groundwater samples in the urban front range for pesticides and nitrate;
- Continue field assessment of the aquifer vulnerability model in the San Luis Valley;
- Obtain and input results of other groundwater monitoring for agricultural chemicals into the Agricultural Chemicals and Groundwater database;
- Continue the implementation of the long term sampling plan;
- Integrate results of other projects to achieve goals in the Act;
- Continue disseminating information on the Act and groundwater protection to special interest groups in Colorado;
- Continue publishing and distributing the newsletter and fact sheets;
- Continue using the display board to provide information on the program at trade shows and professional meetings;
- Complete development of the generic State Management Plan for pesticides.

APPENDICES

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APPENDIX I

AGRICULTURAL CHEMICALS AND GROUNDWATER PROTECTION

April 1994
Fact Sheet #7

Best Management Practices for Agricultural Chemical Handling, Mixing and Storage

Storage and handling of pesticides and fertilizers in their concentrated form poses the highest potential risk to surface or ground water from agricultural chemicals. For this reason, it is essential that facilities for the storage and handling of these products be properly designed, sited, and managed. Colorado law (SB 90-126) requires operations handling large volumes of agricultural chemicals to comply with containment regulations. Operations who fall below the thresholds for mandatory containment should observe best management practices (BMPs) for handling these concentrated products.

The ideal facility provides:

- Separate storage areas for pesticide and fertilizer which are secured and keep the product out of the weather
- Secondary containment of the stored products
- A safe mixing and loading area away from water resources
- Worker protection features such as showers, first-aid, and spill clean up kits.

The ideal management:

- Minimizes the amount of chemicals stored and handled
- Reduces rinsate, container, and product waste
- Maintains good records of all chemical use.

Pesticide and Fertilizer Storage

Plan your storage facilities as a secured, single use area, separate from other activities and storage (feed, seed and fuel). Design the storage area to protect pesticides and fertilizers from possible theft, unauthorized use by untrained personnel, and temperature extremes. Federal law requires that concentrated pesticide be stored in a secured area. Therefore, outdoor storage containers should be located within a permanently fenced area. Be sure to post warning signs near each entrance to the storage facility.

In most cases, pesticide and fertilizer should be stored separately to minimize the possibility of cross contamination or hazardous waste in the case of fire or other disaster. Small operations can avoid the need for multiple storage areas by con-

structing separate containment for pesticide and fertilizer within the same structure. Whenever possible, you should minimize storage of chemicals to avoid the associated risks. Purchasing only the amount of chemical needed, keeping tight inventory control, and using returnable container systems can help small operators minimize storage. However, even small operations need the insurance of a well designed and managed facility. The cost of these preventive measures is far less than the potential costs of a cleanup or lawsuit.

Secondary Containment

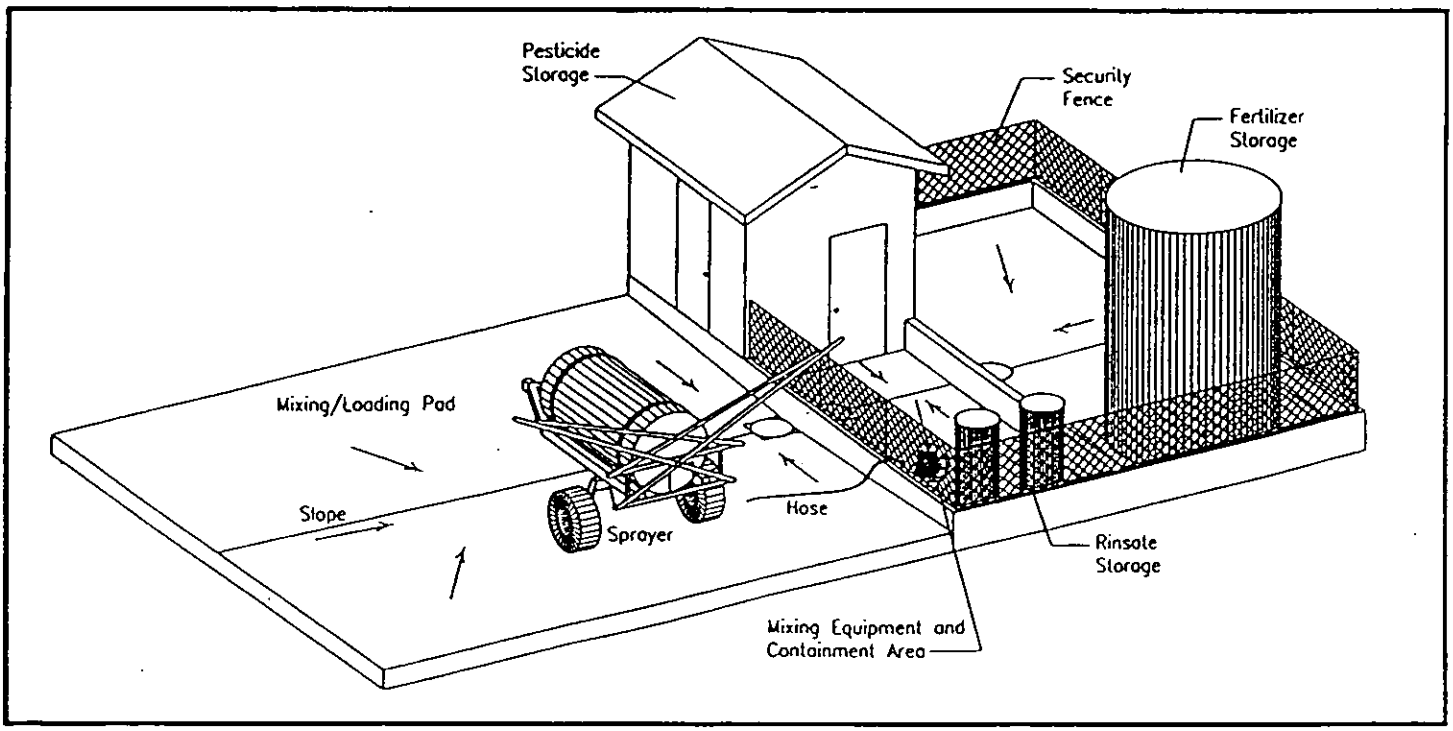
Secondary containment is essentially a back-up system built around primary pesticide and fertilizer storage to capture products that may escape due to leaks or spills. Secondary containment protects the environment from accidental leaks and spills of bulk liquid storage tanks by preventing spills from entering the soil and possibly surface or ground water. Separate containment should be provided for pesticide and fertilizer storage.

Acceptable Containment Methods and Strategies

- Minimize volume and duration of pesticide stored on site
- Double tanks for small volumes
- Concrete floor and walls
- Concrete curbed areas surrounding small volume storage
- Steel floors and walls
- Fiberglass or plastic walls and floors
- Synthetic liners over concrete or composition walls
- Approved portable synthetic containment units

Containment Sizing and Design

Secondary containment facilities should be large enough to hold the entire capacity of the largest storage tank, plus allow freeboard for any other items that may displace storage volume.



Combination mixing and storage area for pesticide and fertilizer handling.

Source: Designing Facilities for Pesticide and Fertilizer Containment, (MWPS-37) MidWest Plan Service, Agricultural Engineering, Iowa State University, Ames, IA. 1991

Rules and regulations pertaining to Colorado law (SB 90-126) require that the capacity of the containment be 110% of the volume of the largest container when protected from precipitation, or 125% of the largest container when unprotected from precipitation.

Mixing and Loading Facilities

The site where pesticides and fertilizers are mixed and loaded prior to application is usually the most vulnerable area to contamination from spills. Unfortunately, it has been common procedure in the past to mix and load chemicals at a single, unprotected location with little thought given to surface or ground water proximity. Business operators may be liable for cleanup of these sites, even after selling the property, if mishandling of agricultural chemicals results in environmental contamination.

One method for avoiding site contamination problems is to mix and load chemicals at the application site. Colorado SB 90-126 exempts operators from utilizing a permanent concrete pad if they mix and load at the application site. Take a nurse tank to the field for mix and wash water and be sure to stay a safe distance from any wells or surface water. A minimum setback of 100 feet,depending on slope and soil characteristics, should be observed to protect water quality. Avoid mixing at the same spot in the field each time you spray and take precautions to prevent spills of any chemical, especially herbicide, during field mixing. The use of direct injection sprayers is becoming commercially feasible, and should be considered by all operators. Direct injection from mini-bulk or small two-way containers allows operators to greatly minimize chemical contact, spills, and waste.

Facilities Maintenance

The life of pesticide and fertilizer storage, containment, and mixing and loading facilities can be substantially extended with regular maintenance. Inspect the facility thoroughly on a seasonal basis to stay ahead of maintenance requirements of the facility. Preventative maintenance can minimize factors that cause deterioration and prevent small problems from becoming large ones.

Good housekeeping procedures are also important to prolonging the life of the facility. Cleaning up fertilizer or pesticide spills promptly will prolong the life of the structure. Keeping the sump, pipes, tanks, and fittings clean and free of corrosion is also important to extending facility life. Keep metal fixtures painted and apply a protective surface coating over high wear concrete and joints. Concrete cracking is a fact of life that must be dealt with as a necessary part of routine maintenance. Cracks which are active are warning signs and should not just be covered up. Determine the cause of the cracks and take the appropriate steps to correct the situation.

Waste Management

Dealers, commercial applicators, and farmers who handle agricultural chemicals must contend with the proper disposal of rinsate, empty containers, and other waste.

To minimize waste at the agricultural chemical handling site:

- Purchase only the amount of chemical needed for each season.
- Return unused chemicals to avoid over-winter storage.
- Mix only the precise amount of chemical needed for the immediate job.
- Calibrate your sprayer properly so that your application rate is correct.
- Use rinsate as make-up water for the next spray batch. Be sure rinsate water is compatible with chemical.
- Use mini-bulk and two-way containers to eliminate container waste.
- Mix chemicals and clean equipment at the application site to reduce rinsate water.
- Recycle empty pesticide containers whenever possible.
- Utilize direct injection spray systems and mini-bulk containers to reduce pesticide waste.
- Roof mixing pads and secondary containment to reduce stormwater handling accumulation.

Recordkeeping

Recordkeeping is an important aspect of managing an agricultural chemical facility. Good records document problems and help managers improve their operations. A written record of all inspections and maintenance should be made on the day of the inspection or maintenance and should be kept at the facility. Inspection and maintenance records should contain the name of the person making the inspection or maintenance, the date, conditions noted, and any maintenance performed. The operator should inventory , measure, and record the liquid level in each storage container at least once a month.

Emergency and Discharge Response Plan

The operator of a fertilizer or pesticide storage facility should prepare a written emergency and discharge response plan for the storage facility. The operator should keep the plan current at all times and keep employees trained in its operation. A copy of the plan should be kept at a prominent location at the storage facility and, if applicable, at the nearest local office from which the storage facility is administered. The plan should be made available for employee use and for inspection. Operators of storage facilities should provide a copy of the plan and a current chemical inventory to the local fire department.

The plan should include:

- The identity and telephone numbers of the persons or agencies who are to be contacted in the event of a discharge, including persons responsible for the stored chemical.
- The procedures and equipment to be used in controlling and recovering or otherwise responding to an emergency or discharge.
- For each chemical stored at the facility, a complete copy of the storage container labeling.
- The identification and location of every fixed storage container located at the facility.

Proper handling of concentrated pesticides and fertilizers reduces the potential risk to surface or ground water. It is much easier and more cost effective to prevent contamination than to clean it up after it happens.

For more in-depth information or specific inquiries about BMPs or containment facilities, contact CSU Cooperative Extension or the Colorado Department of Agriculture. They have publications, programs, and specialists that can help you prevent water pollution.

Related materials that are available include:

SB 90-126 Rules and Regulations - Pesticides and Fertilizers. Colorado Dept of Agriculture. 1994

Designing Facilities for Pesticide and Fertilizer Containment. MidWest Plan Service #37. 1991

Plans and Specifications for Mixing/Loading Pad and Pesticide Storage Building. David W. Kammel and Ronald T. Noyes. In: Pesticide and Fertilizer Containment Symposium 2. Conference Procedings. MidWest Plan Service. 1994

Colorado Department of Agriculture
DIVISION OF PLANT INDUSTRY
Mitch Yergert
Colorado Department of Agriculture
(303) 239-4140

Brad Austin
Colorado Ddepartment of Health
(303) 692-3572

Colorado State University
Reagan Waskom
Colorado State University
(303) 491-6103

STATE OF COLORADO

DEPARTMENT OF AGRICULTURE
DIVISION OF PLANT INDUSTRY

700 Kipling Street, Suite 4000
Lakewood, Colorado 80215-5894
(303) 239-4140
FAX (303) 239-4177

October 21, 1994

Pesticide and Fertilizer Containment Regulations Adopted

The regulations requiring secondary containment and mixing and loading pads for sites where threshold amounts of pesticides and commercial fertilizers are stored and handled have been completed. These regulations are required under the Agricultural Chemicals and Groundwater Protection Act, SB 90-126. The new regulations became effective September 30, 1994.

Enclosed is a copy of the rules and regulations along with a summary sheet that briefly explains the rules and compliance schedule. On the final page of the summary sheet is a checklist to help determine if your operation is governed by these regulations.

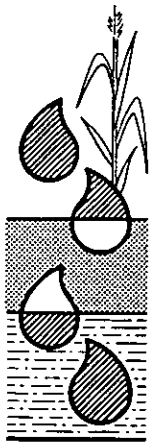
Arrangements are being made to give presentations on the regulations at various meetings of organizations, professional associations and commodity groups this winter. Please contact me as soon as possible if your organization would like a presentation. Questions about the regulations or requests for additional copies of the regulations or fact sheet should be directed to:

Mitch Yergert
Colorado Department of Agriculture
Division of Plant Industry
700 Kipling Street, Suite 4000
Lakewood, CO 80215-5894
(303) 239-4151

Sincerely,

Mitchell Yergert

Mitchell Yergert
Agriculture Program Specialist



AGRICULTURAL CHEMICALS AND GROUNDWATER PROTECTION

Newsletter
Fall 1994

The Agricultural Chemicals and Groundwater Protection Program which resulted from the passage of SB 90-126 is being implemented ...

SUMMARY

- Six statewide BMP chapters have been completed and are now available
- Localized BMPs are being developed in the San Luis Valley and the Front Range/South Platte River basin
- Regulations for secondary containment and mixing and loading areas became effective September 30, 1994
- Regional groundwater monitoring is continuing for pesticides and nitrate
- State Management Plan for pesticide use is being developed

Best Management Practices

The voluntary adoption of Best Management Practices (BMPs) is the focal point of the agricultural chemicals and groundwater protection program. Voluntary adoption of BMPs will help prevent contamination of water resources, improve public perception of the industry, and perhaps eliminate the need for further regulation and mandatory controls. Best Management Practices are recommended methods, structures, or practices designed to prevent or reduce water pollution.

CSU Cooperative Extension is currently developing a series of groundwater protection BMPs for agricultural chemicals. The BMPs are applicable statewide and have been developed with extensive input from the program's citizens advisory committee. The series consists of one booklet that contains an overview of the BMP development process plus the guidance principles and highlights of the 8 subject specific BMP chapters.

Each subject specific chapter contains a guidance principle that each BMP relates to. The BMPs are presented in a grocery list fashion so that the agricultural chemical user can select the BMPs applicable to their situation and voluntarily adopt them to protect groundwater. The 9 booklets are entitled:

- Best Management Practices for Colorado: An Overview
- Best Management Practices for Nitrogen Fertilization
- Best Management Practices for Irrigation Management
- Best Management Practices for Manure Management
- Best Management Practices for Phosphorus Fertilization
- Best Management Practices for Pesticide and Fertilizer Storage and Handling
- Best Management Practices for Agricultural Pesticide Use
- Best Management Practices for Crop Pests
- Best Management Practices for Private Well Protection

The first six booklets are available from CDA or:

CSU Bulletin Room
171 Aylesworth Hall SW
Colorado State University
Ft. Collins, CO 80523
(303) 491-6198.

There is no charge for the documents. The remaining chapters will be completed by early 1995.

Localized BMPs

BMPs that are specific to various regions of the state are also being developed by groups of local agricultural chemical users. These localized BMPs have their foundation in the state-wide BMPs. It was determined that in order to maximize voluntary adoption and for the BMPs to have the greatest impact, they needed to be specific to geographic areas or crop rotations.

A group working in the San Luis Valley in cooperation with the USDA Water Quality Demonstration Project has completed a booklet entitled Best Management Practices for Nutrient and Irrigation Management in the San Luis Valley. They are now working on a similar document for pesticide and pest management. This booklet is available through CSU Cooperative Extension or the San Luis Valley Demonstration Project.

A similar group began work in the fall of 1993 to develop localized BMPs for the area of the South Platte River basin consisting of Adams, Boulder, Larimer and Weld Counties. The publication, Best Management Practices for Irrigated Agriculture - A Guide for Colorado Producers, was produced from the initial efforts of this workgroup. Other groups will be formed for other areas of the state as the program progresses.

Demonstration Plots & Field Days

CSU/CE has been utilizing demonstration and research plots to evaluate and demonstrate nitrogen and irrigation management BMPs for corn production. These plots are located in the South Platte River basin. A field day was held on August 18th in conjunction will several other organizations to give producers the opportunity to see first hand the results of these plots. The program is also working cooperatively with the San Luis Valley Water Quality Demonstration Project to demonstrate BMPs.

Demonstration, research plots and associated field days will continue to be used in the future. Locations for these plots will be expanded to other regions of the state and will focus on additional crops.

Urban BMPs

More pesticides and fertilizers are being used in urban landscapes as Colorado's population grows and the metropolitan areas expand. Adoption of best management practices in these areas is important to protecting groundwater quality.

A BMP manual devoted to urban uses of pesticides and fertilizers will be developed beginning this winter. It will provide a variety of practices that homeowners and commercial and public applicators can utilize.

Containment Regulations Completed

The secondary containment and mixing and loading pad regulations for pesticides and commercial fertilizers required under the program have been completed. The new regulations became effective September 30, 1994. Compliance is required for pesticide facilities covered by the regulations by September 30, 1997, while affected fertilizer operations have until September 30, 1999. There are special requirements and an extended time period for liquid fertilizer tanks with a capacity of 100,000 gallons or more. Copies of the regulations are available from the Colorado Department of Agriculture (CDA). Also, the Department of Agriculture has a checklist available to help you determine if your operation will be subject to the new regulations.

Presentations about the regulations and the time line for compliance will be ongoing this winter at various commodity or professional association meetings. To date arrangements have been made for the:

* Western Turfgrass Conference
* Potato/Grain Conference
* S. High Plans Water Mgmt Dist Workshop
* Colorado Aerial Applicator's Association Conference
* International Society of Arborists

Organizations wishing to have a presentation or individuals wanting further information should contact Mitch Yergert at (303) 239-4140.

Groundwater Monitoring Continues

Monitoring groundwater for the presence of pesticides and nitrate is important to determine if these agricultural chemicals are impacting water quality. Practically no groundwater quality data for pesticides existed in Colorado and many areas had only limited nitrate data. Monitoring was initiated in the major aquifers overlain by intensive agricultural production to determine a baseline for water quality in the state. In 1992, the Colorado Department of Public Health and Environment (CDPHE) sampled shallow rural domestic wells in the alluvial aquifer along the South Platte River from Denver to the Nebraska state line. Ninety-six wells were sampled once and analyzed for 37 pesticides used in the area as well as the basic inorganics which includes nitrate. Atrazine was the only pesticide detected in more than one well, however the concentrations were very low and never exceeded half of the maximum contaminant level. Nitrate above the 10 mg/L drinking water standard were found in 33% of the wells.

Based on the results from 1992, follow-up monitoring was performed in 1993 in Morgan and Sedgwick Counties. Forty-seven wells including 25 that were sampled in 1992 were sampled and analyzed for nitrate. Nitrate exceeded the drinking water standard in 33% of the wells. The full report is available from the Department of Agriculture.

In 1993, shallow rural domestic wells in the San Luis Valley unconfined aquifer were sampled. These 93 samples were analyzed for 27 pesticides and nitrate. Only three pesticides were detected and each in just one well at very low levels. Nitrate above the 10 mg/L drinking water standard were detected in 14% of the wells sampled. A full report will be available in early 1995.

Approximately 150 wells in the Arkansas River basin were sampled and analyzed for agricultural chemicals during the summer of 1994. Results of these analyses are pending. Monitoring in urban areas along the front range is planned for 1995.

Determining Groundwater Vulnerability

CDPHE is beginning to field test a process to use in determining if groundwater in various areas of the state is susceptible to contamination by pesticides and fertilizers. If this process is proven effective it will be utilized to set priorities for future groundwater monitoring. The process establishes three levels of vulnerability assessment: a quick-look assessment that is modified from the Soil Conservation Service's soil-pesticide interaction rating scheme; an intermediate level assessment which uses the same scheme with much greater detail in its input parameters; and a detailed assessment that adds the screening models Chemical Movement in Layered Soils (CMLS) for pesticides and Nitrate Leaching and Economic Analysis Package (NLEAP) for nitrate.

State Management Plan Under Development

In October of 1991, the EPA released their Pesticides and Ground-Water Strategy. The document describes the policies, management programs, and regulatory approaches that the EPA will use to protect the nation's groundwater resources from risk of contamination by pesticides. It emphasizes prevention and resource protection over remedial treatment. The centerpiece of the Strategy is the development and implementation of State Management Plans (SMPs) for pesticides that pose a significant risk to groundwater resources.

The EPA will require an SMP for a specific pesticide if: (1) the Agency concludes from the evidence of a chemical's contamination potential that the pesticide "may cause unreasonable adverse effects to human health or the environment in the absence of effective local management measures; and (2) the Agency determines that, although labelling and restricted use classification measures are insufficient to ensure adequate protection of groundwater resources, national cancellation would not be necessary if the State assumes the management of the pesticide in sensitive areas to address effectively the contamination risk. If the EPA invokes the SMP approach for a pesticide, its legal sale and use would be restricted to States with an EPA-approved Pesticide SMP.

Therefore, to continue use of the pesticide in the State, the State must produce a management plan that defines its strategy to prevent the pesticide from impacting groundwater. This plan must contain 12 components that the EPA has developed as part of the guidance document for the program. These range from the State's legal authority to regulate the pesticide, public participation, prevention actions to responses to detections of the pesticide in groundwater. The EPA must formally agree with the plan or use of the pesticide will be canceled in the state.

As a precursor to this action, Colorado has begun development of a generic state management plan that can be adapted as necessary to address specific pesticides that the EPA determines require a Pesticide-Specific State Management Plan (PSMP). Currently, it is believed the EPA will not require a PSMP before 1996.

Advisory Committee Integral to Implementation

The citizens Advisory Committee to the program continues to be an integral component to the implementation of the Agricultural Chemicals and Groundwater Protection Program. Advisory Committee meetings are held about 4 times a year to review progress and make decisions about future direction. Committee members are appointed by the Colorado Agricultural Commission and serve a three year term. Mike Mitchell, a Monte Vista area farmer is the current chairman. The 17 members include:

Producers

- Mike Mitchell, Monte Vista
- Les Yoshimoto, Sedgwick
- Max Smith, Walsh
- Harry Talbott, Palisade
- Leon Zimbelman, Jr., Keenesburg
- Rob Sakata, Brighton
- Jerry McPherson, Yuma
- John Hardwick, Vernon

Agricultural Chemical Suppliers

- James Klein, Centennial Ag Supply, Kersey
- Wayne Gustafson, Agland, Inc., Eaton

Green Industry

- David Brown, Flatirons Golf Course, Boulder
- Mike Deardorff, Kitayama Brothers Greenhouse, Brighton

General Public

- Tess Byler, Littleton
- Barbara Taylor, Boulder

Commercial Applicators

- Ray Edmiston, Aerial Sprayers, Inc., Longmont
- Steve Geist, Swingle Tree Co., Denver

Water Quality Control Commission

- Roger Bill Mitchell, Monte Vista

Colorado Department of Agriculture
DIVISION OF PLANT INDUSTRY
Mitch Yergert
Colorado Department of Agriculture
(303) 239-4140

Brad Austin
Colorado Ddepartment of Health
(303) 692-3572

Colorado State University
Reagan Waskom
Colorado State University
(303) 491-6103

AGRICULTURAL CHEMICALS AND GROUNDWATER PROTECTION

SUMMARY OF RULES AND REGULATIONS FOR BULK STORAGE FACILITIES AND MIXING AND LOADING AREAS FOR FERTILIZERS AND PESTICIDES

This summary is meant to highlight the rules and regulations developed to fulfill requirements of the Agricultural Chemicals and Groundwater Protection Act, Senate Bill 90-126. This summary sheet covers only key points of the rules and is meant to convey a general overview. A checklist is also included on the last page of this document to assist in determining if these rules and regulations apply to your operation.

SCOPE OF RULES AND REGULATIONS

Senate Bill 90-126 addresses two key elements in agricultural chemical handling: secondary containment of storage containers, and mixing and loading pads. These two elements are further divided by the product handled, i.e., pesticides or fertilizers, and whether the product is in liquid or dry form, as follows:

Pesticides

Secondary Containment: Required of any bulk storage facility, liquid or dry. Bulk storage facilities are those handling containers with capacities of greater that 55 gallons liquid or 100 pounds dry. However, facilities handling only DOT 57 or MACA-75 approved mini bulk containers up to 660 gallons are exempt from secondary containment requirements.

Mixing and Loading Pads: Required where at least 500 gallons of liquid formulated product or 3000 pounds of dry formulated product are handled annually; also required where 1500 pounds of active ingredient or a combination of liquid and dry product is handled annually. Additionally, any bulk pesticide storage facility required to have secondary containment must also have a mixing and loading pad.

Fertilizers

Secondary Containment: Required of liquid storage facilities where any container or series of interconnected containers has a capacity of greater that 5000 gallons, and dry storage facilities where at least 55,000 pounds of bulk fertilizer are stored.

Mixing and Loading Pads: Fertilizer storage facilities required to have secondary containment must also have a mixing and loading pad.

* It should be noted that field mixing and loading of agricultural chemicals are exempt from these rules and regulations.

COMPLIANCE SCHEDULE

Compliance is required by:

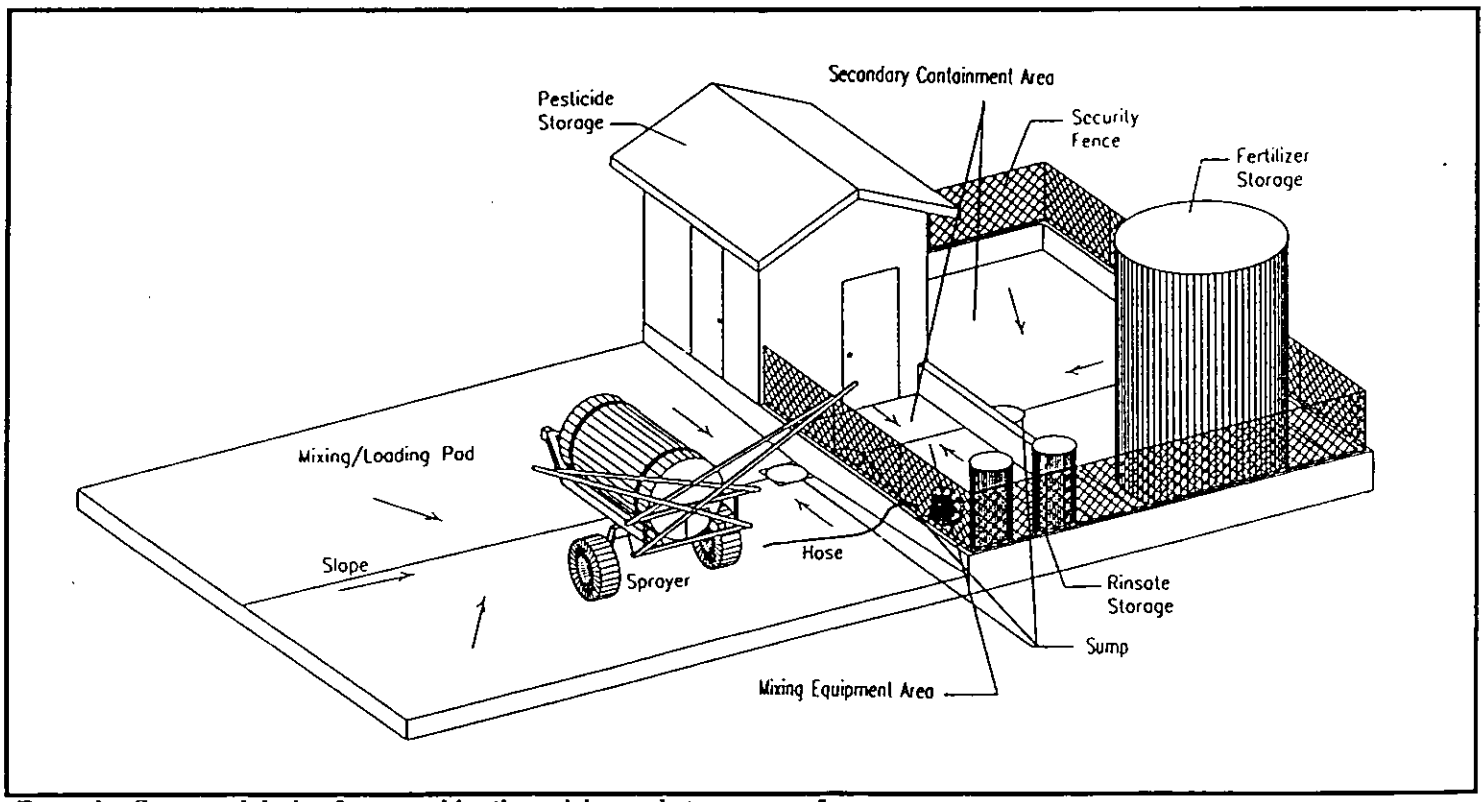
- **September 30, 1997** for liquid pesticide secondary containment and mixing and loading pads.
- **September 30, 1997** for liquid fertilizer tanks greater than 100,000 gallons, one of the three prescribed methods of leak detection must be utilized unless full secondary containment is in place.
- **September 30, 1999** for liquid fertilizer secondary containment and mixing and loading areas.
- **September 30, 2004** for secondary containment of fertilizer storage tanks with a capacity greater than 100,000 gallons.

SECONDARY CONTAINMENT FOR THE STORAGE OF LIQUID AGRICULTURAL CHEMICALS

All liquid agricultural chemical containers must be stored in an impervious secondary containment structure (SCS) capable of supporting the weight of full tanks, resisting chemical corrosion, and containing a discharge. The capacity of the SCS is up to 125 percent of the volume of the largest container in the structure. The walls shall be of such a height as to allow easy inspection and egress. The floor of the SCS shall be designed to drain to a shallow sump. Discharges or precipitation accumulations in an SCS shall be promptly recovered by a manually activated pump; however, automatic pumps may be used to remove precipitation during the inactive season provided all tanks in the SCS are empty. The SCS must be maintained as impervious over its service life. Special requirements apply to very large (over 100,000 gallons) fertilizer storage containers.

MIXING AND LOADING AREAS FOR LIQUID AGRICULTURAL CHEMICALS

All mixing and loading operations must take place on an impervious mixing and loading pad (MLP) capable of handling the wheel loads of vehicles served on it. The pads need only be large enough so that the tank and appurtenances are over the pad provided no flushing of the boom system occurs. Capacity of the MLP is up to 125 percent of the volume of the largest container (up to 1200 gallons) using the pad. An MLP serving containers holding more than 1200 gallons need only be designed to the 1200 gallon container standard. If the primary use of the MLP is to service chemical application equipment and bulk transport vehicles only use the pad for occasional deliveries, then the pad size is determined by the container size of the application equipment. However, the bulk transport must conduct its operations with appurtenances over the MLP. The MLP shall be designed to drain to a shallow sump. Discharges or precipitation accumulations in an MLP shall be promptly recovered by a manually activated pump. Automatic pumps may be used to remove precipitation during the inactive season. The MLP must be maintained as impervious over its service life.



Example: Suggested design for a combination mixing and storage area for pesticide and fertilizer handling which would meet Colorado regulations.

Source: Designing Facilities for Pesticide and Fertilizer Containment, (MWPS-37) MidWest Plan Service, Agricultural Engineering, Iowa State University, Ames, IA. 1991

OPERATIONS OF LIQUID AGRICULTURAL CHEMICAL PRIMARY AND SECONDARY CONTAINMENT FACILITIES AND MIXING AND LOADING AREAS

Storage containers and appurtenances shall be designed and constructed of materials which are resistant to corrosion, puncture or cracking and can handle operating stress. Storage containers shall be secured to prevent flotation or instability. Storage container connections, except safety relief connections, shall be equipped with a shut-off valve. Plumbing shall be adequately supported and a flexible connection is required between plumbing and storage containers. Every storage container shall have a device or method for measuring the liquid level. Pesticide storage containers shall be properly labeled and equipped with a pressure regulated vent. Abandoned storage containers shall be thoroughly cleaned.

DRY BULK AGRICULTURAL CHEMICALS

Dry bulk agricultural chemicals (DBAC) shall be stored inside a sound structure to prevent contact with precipitation. The floor of the structure shall be constructed of a material resistant to chemical corrosion and capable of preventing downward movement of DBAC or the upward movement of moisture through the floor. All handling of DBAC shall be done on a mixing and loading pad designed and constructed of material so as to form a barrier between the DBAC handling area and the surrounding earth, facilitate easy cleanup of spills and handle wheel loads of vehicles served. All spills shall be promptly recovered. The pad must be maintained as a barrier for the life of the structure.

OPERATIONS-ALL FACILITIES

All agricultural chemicals in the facilities shall be secured against access by unauthorized persons. Valves on storage containers shall be locked except when persons responsible for facility security are on site. A device or method to prevent back flow in the water supply line shall be installed. Regular inspection and maintenance of the facility shall be performed. If operations at a facility are discontinued, the Colorado Department of Agriculture must be notified, all agricultural chemical product removed and storage containers cleaned.

SITE PLAN DESIGN AND CONSTRUCTION

The design of bulk storage facilities and mixing and loading areas must be signed and sealed by a Colorado registered professional engineer, or from a source approved by the Commissioner of Agriculture. Approved generic plans for small to medium sized facilities are available (after January 1, 1995) through the CSU Cooperative Extension Plan Service (303/491-6172).

CHEMIGATION SYSTEMS

Storage containers for liquid fertilizer at a chemigation site will be covered by secondary containment regulations if the containers's capacity is more than 5000 gallons.

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SUGGESTED MATERIALS SUITABLE FOR CONSTRUCTION TO SATISFY REQUIREMENTS OF SB 90-126

Materials used for secondary containment or a mixing and loading pad must be constructed to a water permeability rate of 1×10^{-7} centimeters per second.

Some of the materials which meet this requirement include:

- good quality concrete
- 1/4 inch coated steel
- stainless steel
- poly or fiberglass tank (for secondary containment only)
- synthetic liner (HDPE, PVC, Hypalon)
- good quality asphalt (for use with dry bulk agricultural chemicals only)
- clay, natural soil-clay mixtures, clay-bentonite mixtures, or prefabricated bentonite liners (for use in secondary containment of liquid bulk ferilizer only)

The following checklist will assist you in determining if the rules and regulations apply to your operation:

PESTICIDES

YES NO

Secondary Containment:

1) Do you store pesticides in containers larger than 55 gallons for liquid pesticides or 100 pounds for dry pesticides? . . . . . ☐ ☐

If you answered no to question 1, secondary containment is not required, skip questions 2 and 3.

2) Do you store pesticides in containers larger than 55 gallons that are not Department of Transportation 57 or MACA 75 approved? . . . . . ☐ ☐

3) Do you store pesticides in containers larger than 660 gallons? . . . . . ☐ ☐

If you answered yes to either question 2 or 3 secondary containment of pesticides stored in this manner is required.

Mixing and Loading Pads:

4) Do you mix and load at one site annually (any site within 300 feet of another site is considered one site for these regulations) more than:

a) 500 gallons of liquid formulated product (concentrate as it comes from the supplier), OR

b) 3000 pounds of dry formulated product, OR

c) 1500 pounds of active ingredient of a combination of liquid and dry product. . . . . ☐ ☐

If you answered yes to any part of question 4, a mixing and loading pad for pesticides is required.

If secondary containment is required above, a mixing and loading pad is also required.

FERTILIZERS

5) Do you store liquid fertilizer in a container or series of interconnected containers with a capacity of greater than 5,000 gallons ? . . . . . ☐ ☐

If yes, secondary containment is required.

6) Do you store bulk (containers larger than 100 pounds) dry fertilizer in quantities of 55,000 pounds or more? . . . . . ☐ ☐

If yes, containment is required.

A mixing and loading pad for fertilizer is required only if you answered yes to either question 5 or 6.

Field mixing & loading of pesticides or fertilizers is exempt from these regulations.

Complete copies of the regulations are available from the Colorado Department of Agriculture.

Any questions or comments should be directed to:

Mitch Yergert
Colorado Department of Agriculture
700 Kipling St., Suite 4000
Lakewood, CO 80215-5894
(303) 239-4140

OR

Lloyd Walker
Department of Ag & Chem. Engineering
105 Engineering South
Colorado State University
Fort Collins, CO 80523
(303) 491-6172

APPENDIX II

1994 Annual Report
Colorado State University Cooperative Extension

Accomplishments:

1. Conducted educational programs throughout Colorado on SB 90-126 and issues related to agricultural chemicals and groundwater quality. Groups addressed include commercial applicators, chemical dealers, weed districts, crop consultants, crop and livestock producers, agency personnel, and urban chemical users.

2. Completed the preparation of 9 BMP chapters covering nutrient, pesticide, irrigation, manure, and water well management. These chapters will be printed and incorporated into a notebook for agricultural chemical users in Colorado.

3. Worked with two local groups in Colorado to develop localized BMP guidelines for groundwater protection. The local group in the San Luis Valley published their findings in a booklet entitled "Best Management Practices for Nutrient and Irrigation Management in the San Luis Valley". The local group in the front range area published their work in a booklet entitled "Best Management Practices for Colorado Agriculture".

4. Conducted nutrient management demonstrations on 6 farmer fields and hosted a BMP field day in the S. Platte area to introduce the public to proper nitrogen, manure, pesticide and water management practices.

5. Produced newsletter articles, press releases, factsheets, technical papers, radio and other mass media articles on groundwater protection in Colorado.

6. Worked to coordinate efforts of the Agricultural Chemicals and Groundwater Protection program with other state and federal programs in Colorado.

7. Assisted the Colorado Department of Agriculture in the implementation of the Bulk Storage Regulations and the development of the generic State Management Plan required by EPA.

BMP Development

Colorado State University Cooperative Extension is working with the Colorado Department of Agriculture to develop Best Management Practices for Colorado farmers, land owners, and commercial chemical applicators. The BMPs adopted for use at the local level must ultimately be determined by the chemical user because of the site specific nature of groundwater protection. The local perspective is also needed to evaluate the feasibility and economic impact of these practices. The SB126 Advisory Committee has recommended that a significant level of input be received at the local level prior to adoption of recommended BMPs.

Colorado State University Cooperative Extension has compiled a broad set of BMPs encompassing nutrient, pest, and water management which will be used as a template for local committees. This document will be published in a notebook form in early 1995 that can be updated as needed and expanded to include additional guidelines.

Cooperative Extension has piloted the local BMP development process in the San Luis Valley and in the front range area of the South Platte Basin. The local working committees consist of a small group of producers, consultants, and chemical applicators. The San Luis Valley group has produced a set of BMPs appropriate for their area which are being publicized and will be implemented by cooperating farmers in field scale demonstrations. The South Platte group is working towards consensus in a very complex farming region. Both of these groups have produced BMPs for nutrient and irrigation management - the most serious problem in their respective areas. They are now working on pest and pesticide management BMPs for specific crops. Other groups in Colorado have contacted CSU about localizing BMPs in their area. However, time and personnel limitations may delay work in other parts of the state until the two pilot areas are further along in the implementation process.

Field Demonstrations

Colorado State University Cooperative Extension worked with the USDA Agricultural Research Service and farmers on field research and educational plots during 1994 to demonstrate improved nitrogen, manure, and irrigation management techniques. New production tools are being evaluated and demonstrated to farmers which may improve producer profitability and help protect groundwater.

Field trials were held on 6 farms in the basin during 1994. An educational field day was held to acquaint other producers and interested parties with the need for groundwater protection.

A new technology known as in-season nitrate testing was demonstrated to farmers at the field days. This tool may help farmers improve N recommendation accuracy and minimize the use of "insurance" N fertilizer. By complementing preplant soil testing with in-season testing, it may be possible to improve N fertilizer requirement prediction accuracy, resulting in reduced leaching of NO_3 to groundwater. Quick soil test kits for NO_3 have been developed that allow "field testing," thereby alleviating the problem of slow turn-around time in commercial soil testing laboratories. The development of these quick test kits has made the in-season nitrate test a viable soil testing procedure for assessing the N fertility status of crops at any growth stage. It is expected that this will result in the joint use of preplant deep soil NO_3 testing and in-season testing which will increase the accuracy of N fertilizer recommendations. The total application of N fertilizer can be decreased without negatively affecting crop yields as farmers adopt this improved technology.

Other production tools being evaluated and demonstrated to farmers include the portable chlorophyll meter to access N status of growing plants and surge irrigation valves to help decrease irrigation water runoff and leaching. Additionally, research is being conducted on the usefulness of the NLEAP computer model in selecting and evaluating BMPs for nitrogen leaching.

Project sponsors include Colorado State University Cooperative Extension and Department of Soil & Crop Sciences, USDA Agricultural Research Service, Northern Colorado Water Conservancy District, and the Soil Conservation Service. Farmer Cooperators included Mr. Dennis Hoshiko, Weld Co., Mr. Bill Haselbush, Boulder Co., Mr. Steve Kelley, Weld Co., Mr. Mike Laber, Boulder Co., Mr. Bob Schnieder, Weld Co., and Mr. Bob Walker of Morgan County.

Best Management Practices For Colorado Agriculture: An Overview

Colorado State University Cooperative Extension

August 1994

Bulletin #XCM-171

Principal author: Reagan M. Waskom
Extension Water Quality Specialist
Colorado State University Cooperative Extension

In association with: Colorado Department of Agriculture and the
Agricultural Chemicals and Groundwater Protection
Advisory Committee

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and Crop Sciences
Colorado State University Department of Ag
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Colorado Department of Agriculture
DIVISION OF PLANT INDUSTRY

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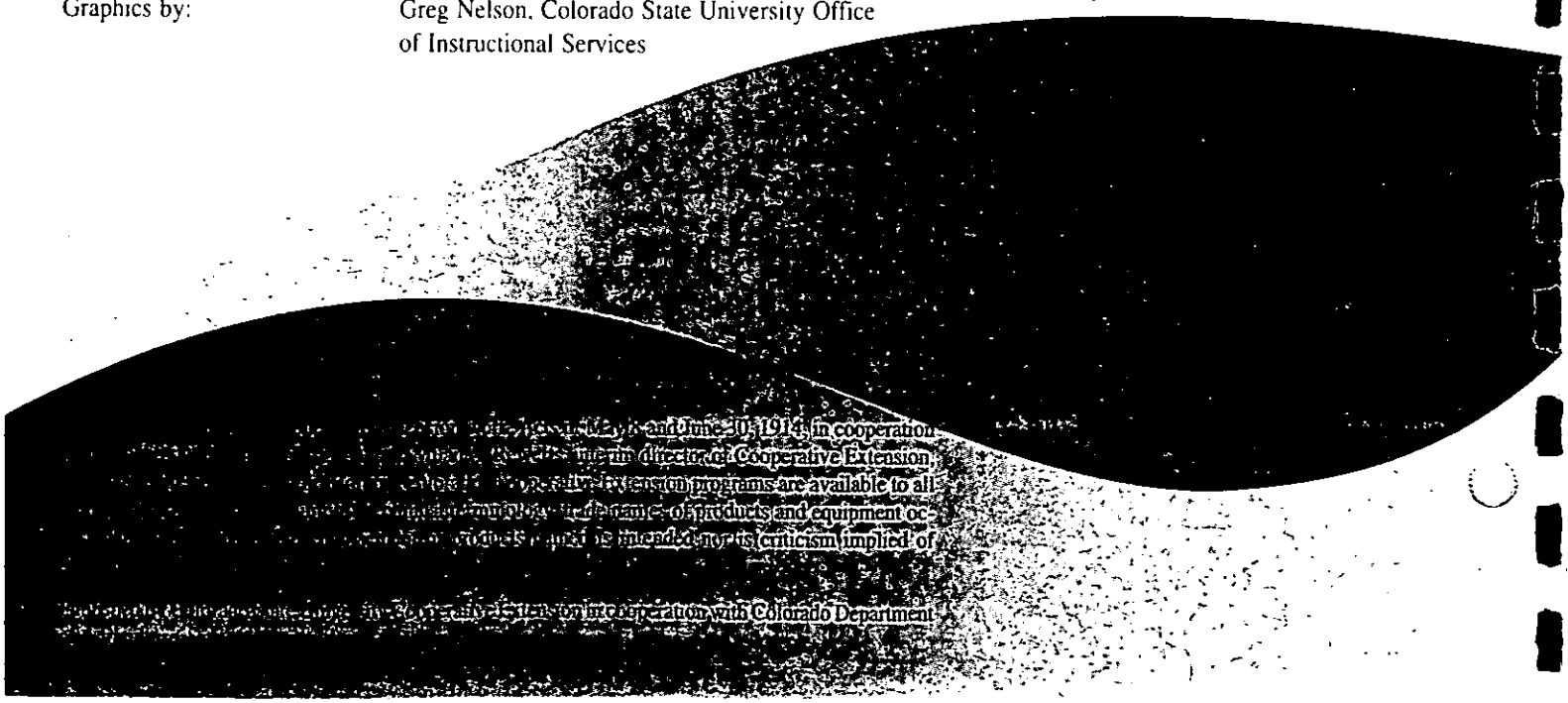

Best Management Practices For Nitrogen Fertilization

Colorado State University Cooperative Extension

August 1994

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Best Management Practices For Manure Utilization

Colorado State University Cooperative Extension

August 1994

Bulletin #XCM-174

Best Management Practices For Phosphorus Fertilization

Colorado State University Cooperative Extension

August 1994

Bulletin #XCM-175

Best Management Practices For Irrigation Management

Colorado State University Cooperative Extension

August 1994

Bulletin #XCM-173

Best Management Practices For Pesticide And Fertilizer Storage And Handling

Colorado State University Cooperative Extension

August 1994

Bulletin #XCM-178

APPENDIX III

COLORADO DEPARTMENT OF HEALTH
Water Quality Control Division
Ag Chemicals Program

Executive Summary

The Water Quality Control Division (WQCD) of the Colorado Department of Public Health and Environment (CDPHE) has responsibility under the Agricultural Chemicals and Ground Water Protection Program (SB 90-126) to conduct monitoring for the presence of commercial fertilizers and pesticides in ground water. This data assists the Commissioner of Agriculture in determining whether agricultural operations are impacting ground water quality. This past year the program monitored groundwater quality in one of Colorado's major agricultural regions, the Arkansas River Valley. The program sampled one hundred forty six (146) domestic, stock, and irrigation wells throughout the valley (Figure 1). Each well was sampled once between July and December, 1994. Well samples were analyzed for basic constituents, dissolved metals, and selected pesticides. Preliminary analysis of the laboratory reports indicates that ground water in some areas of the valley has been impacted by various agricultural chemicals. The major inorganic contaminant of concern is nitrate. Eighteen of 146 (12%) of the wells sampled showed nitrate levels in excess of the EPA standard for drinking water (10 mg/L). The majority of the wells that exceeded the nitrate standard were located in Otero County. Twelve of 146 (8%) samples showed positive for the herbicide Atrazine and one sample detected the herbicide Metolachlor. All pesticide detections where well below the drinking water standard.

Analysis of the 1993 San Luis Valley survey data and comparisons with historic data gathered in 1973, 1984, and 1990 confirms an area of elevated nitrate levels in the ground water near Center Colorado. Preliminary data from the U.S. Geological Survey, National Water Quality Assessment supports this conclusion. A long term sampling program for nitrate in the intensive agricultural region north of the Rio Grande River is currently being conducted in a joint effort by the Rio Grande Water Conservancy District, Natural Resource Conservation Service, and the U.S. Geologial Survey.

In addition to monitoring ground water for the presence of agricultural chemicals, the Ag Chemicals Program is required to determine the likelihood that an agricultural chemical will enter the ground water. This type of determination has been described as a vulnerability analysis. As the first step in this process, the Program funded researchers at Colorado State University to develop a model suitable for use in the Colorado environment. After review and consultation with other agencies working on similar research, a limited field test to evaluate the model in the San Luis Valley was initiated in 1994. The data needed for the evaluation is currently being gathered. The results will be evaluated and incorporated into a method to determine vulnerability statewide. This effort will be extremely valuable in the implementation of the State Management Plan for pesticides required by the Federal FIFRA act.

Introduction

The Water Quality Control Division (WQCD) of the Colorado Department of Public Health and Environment (CDPHE) has responsibility under the Agricultural Chemicals and Ground Water Protection Program (SB 90-126) to conduct monitoring for the presence of commercial fertilizers and pesticides in ground water. The Agricultural Chemicals Program has been established to provide current, scientifically valid, ground water quality data to the Commissioner of Agriculture. Prior to passage of SB 90-126, a lack of data had prevented an accurate assessment of impacts to groundwater quality from agricultural operations. This program will assist the Commissioner of Agriculture in determining to what extent agricultural operations are impacting ground water quality. The program also assists the Commissioner in identifying those aquifers that are vulnerable to contamination. The philosophy adopted is to protect ground water and the environment from impairment or degradation due to the improper use of agricultural chemicals, while allowing for their proper and correct use.

This report has been prepared for the Colorado General Assembly to provide a summary of the work completed in 1994. The monitoring program involves the collection and laboratory analysis of ground water samples. This monitoring program was planned to meet the objectives necessary for a preliminary determination of the existence of agricultural chemicals in the ground water in a safe, cost effective, and timely manner.

The ground water quality sampling program is intended to fulfill the following objectives:

1. Determine if agricultural chemicals are present in the ground water.
2. Provide data to assist the Commissioner of Agriculture in the identification of potential agricultural management areas.

The factors considered in selecting an area for monitoring are:

1. Agricultural chemicals are used in the area.
2. The ground water in the area is shallow in depth or vulnerable.
3. The majority of the agricultural production in the area is irrigated.
4. The soil types are conducive to leaching.
5. The alluvial and /or shallow bedrock aquifers are utilized for domestic water supplies.

Before an area is selected for monitoring, CDPHE will contact interested parties to inform them of the sampling program and SB 90-126, and how we envision its implementation. CDPHE will coordinate closely with federal agencies, county extension agents, conservancy districts, and local health officials in the project area.

Ground Water Monitoring Program

The 1994 monitoring program focused on groundwater quality monitoring in one of Colorado's major agricultural regions, the Arkansas River Valley. A map of the study area is provided in Figure 1. The monitoring program included sample collection, laboratory analysis, and data analysis and storage. Upon completion of the full analysis, which will include integration with previous and current studies by other agencies, this sampling program will provide the basis for determining a groundwater quality baseline for this region.

The Ag Chemicals Program of the Water Quality Control Division sampled one hundred forty six (146) domestic, stock, and irrigation wells throughout the shallow alluvial aquifer that lies along the Arkansas River. The Arkansas valley sampling program was the first effort to screen the entire shallow aquifer to establish the possible impacts and magnitude of agricultural chemical contamination. The Arkansas valley is characterized by intense irrigation agriculture encompassing both surface water diversions and large capacity irrigation wells for irrigation water supplies. The wells supply surface and center-pivot irrigation systems from the shallow unconfined aquifer. This shallow aquifer is also a significant source for domestic water supplies throughout the valley.

All wells were sampled once between July and December, 1994. Wells were selected for sampling based on the following factors: located within the unconfined valley fill aquifer, cooperation of the well owner, no known construction deficiencies, history of contamination or other local factors that would render the sample unrepresentative of regional ground water quality. All field sampling was performed by Brad Austin and John Colbert of CDPHE. Field sampling procedures followed the protocol developed by the Ground Water Quality Monitoring Working Group of the Colorado Nonpoint Task Force.

Well samples were analyzed for basic constituents, dissolved metals, and selected pesticides. A list of analytes is presented in Table 1. The basic and metals analysis was performed by the Soils Laboratory at Colorado State University with all samples split with the Colorado Department of Agriculture Standards Laboratory for nitrate for quality control evaluation.

In addition to the inorganic parameters, all of the groundwater samples collected were analyzed for selected pesticides. The pesticide analysis was performed by the Colorado Department of Agriculture Standards Laboratory. A listing of pesticides was compiled for analysis based on those substances that have recently been, or are currently being utilized in the Arkansas Valley according to agricultural officials there. Budget restrictions would not allow testing for all pesticides used in the study area. To reduce the analysis cost, each pesticide was weighted according to its chemical properties of persistence and mobility in the environment, amount of active ingredient used per acre, and the amount of acreage within the study area that pesticide was used on. Pesticides were

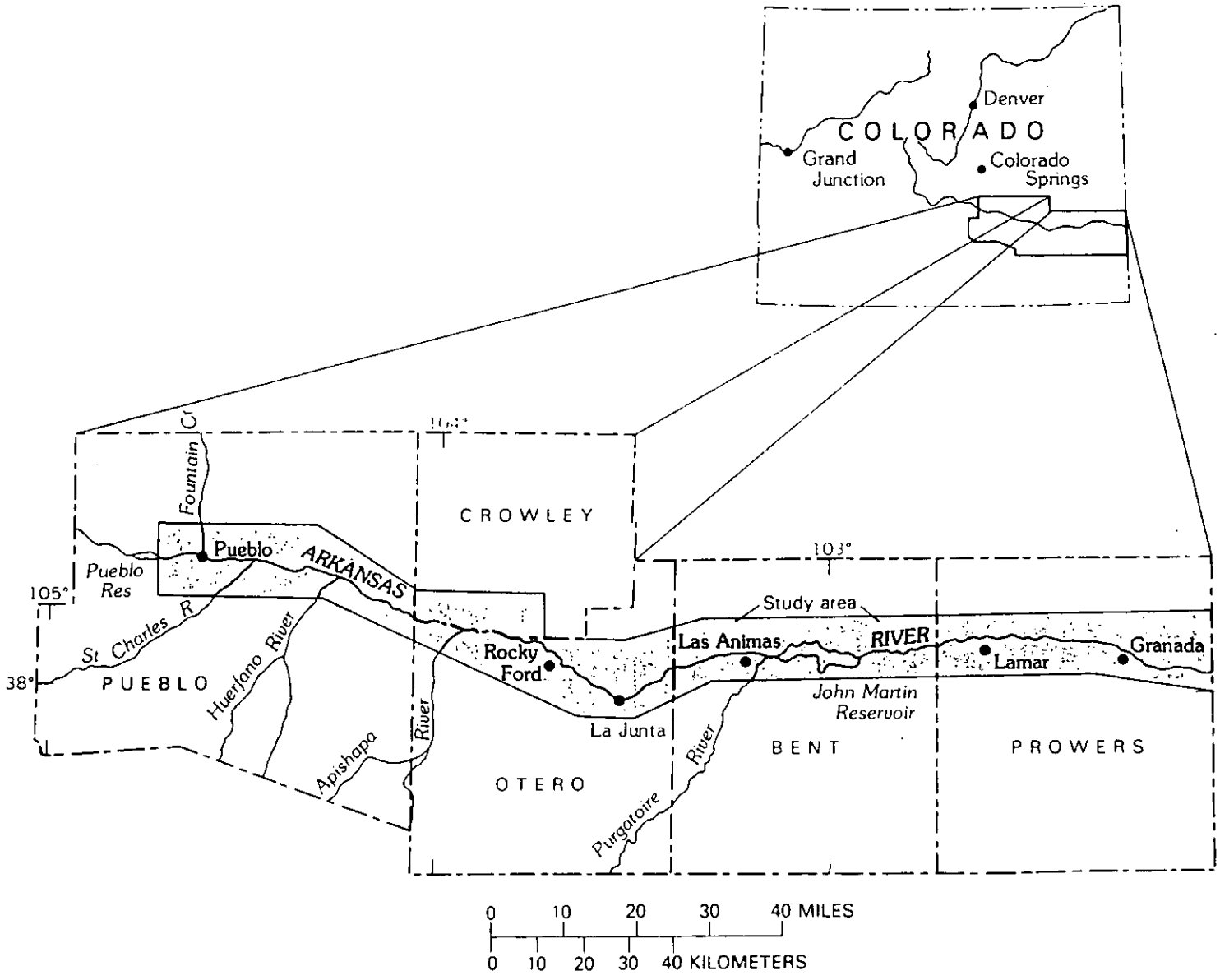

Figure 1.--Location of study area.

TABLE - 1

Arkansas Valley Unconfined Aquifer
List of Analytes

BASIC WATER QUALITY CONSTITUENTS

Boron
Bicarbonate
Calcium
Carbonate
Chloride
Magnesium
Nitrate
pH
Sodium
Specific Conductance (TDS)
Sulfate
Potassium
Alkalinity, total
Solids, Total Dissolved
Hardness, total

DISSOLVED METALS

Aluminum
Barium
Cadmium
Chromium
Copper
Iron
Lead
Manganese
Nickel
Molybdenum
Phosphorous, total
Zinc

PESTICIDE COMPOUNDS

Name	Use	Name	Use
Alachlor	Herb	2,4-D	Herb
Atrazine	Herb		
Benfluralin	Herb	Aldicarb	Insect
Chlorpyrifos	Insect	Aldicarb Sulfone	Insect
Chlorthalonil	Fung	Aldicarb Sulfoxide	Insect
Cyanazine	Herb	Baygon	Insect
DDT	Insect	Carbaryl	Insect
Endrin	Insect	Carbofuran	Insect
Heptachlor	Insect	3-Hydroxycarbofuran	Insect
Heptachlor Epoxide	Insect	Methiocarb	Insect
Lindane	Insect	Methomyl	Insect
Methoxychlor	Insect	Oxamyl	Insect
Metolachlor	Herb		
Metribuzin	Herb		
Trifluralin	Herb		
Hexazinone	Herb		

then selected according to their final score and the ability of the laboratory to detect their presence.

The results from this sampling program have been entered into the CDPHE Groundwater Quality Data System recently developed at CDPHE. A detailed report describing the area sampled, the protocol for sampling and analysis, and the results of the analysis will be provided to the Commissioner of Agriculture in 1995.

At the time of this report, a complete analysis of all laboratory results for the Arkansas Valley has not been completed. Preliminary analysis of nitrate and some of the pesticide data indicates that ground water in parts of the study area has been impacted by various agricultural chemicals. The major inorganic contaminant of concern is nitrate. Eighteen of the one hundred forty six wells sampled (12%) showed nitrate levels in excess of the EPA standard for drinking water (10 mg/L). The drinking water standard is used as a benchmark for nitrate levels in all wells regardless of use because the alluvial aquifer is a significant source of drinking water in the valley. Twelve of the one hundred forty six samples (8%) showed positive for the herbacide Atrazine and one sample detected the herbacide Metolachlor. All pesticide detections where well below the drinking water standard.

The U. S. Geological Survey (USGS) is currently planning to monitor the area under the National Water Quality Assessment (NAWQA) program. This work is scheduled to begin after 1998. This study, and all other existing data, will be incorporated into the final water quality analysis for the Arkansas Valley.

Aquifer Vulnerability Study Summary

In addition to monitoring ground water for the presence of agricultural chemicals, the Ag Chemicals Program is required to determine the likelihood that an agricultural chemical will enter the ground water. This determination is based upon the chemical properties of the chemical in question, the behavior of a particular chemical in the soil types of the region under study, the depth to ground water, the farming practices in use, and other factors. This type of determination has been described as a vulnerability analysis. As the first step in this process, a study was funded by the program to researchers at Colorado State University to develop a model suitable for use in the Colorado environment. The model establishes three levels of vulnerability assessment: a quick-look assessment; an intermediate level assessment; and a detailed assessment. The quick-look is modified from the Natural Resource Conservation Service's (NRCS) soil-pesticide interaction rating scheme. The intermediate level uses that same scheme with much greater detail in its input parameters. The detailed assessment adds the screening models Chemical Movement in Layered Soils (CMLS) for pesticides and Nitrate Leaching and Economic Analysis Package (NLEAP) for nitrates.

The Program has reviewed the model and consulted with other agencies working on similar research. A limited field test to evaluate the model was initiated in the San Luis Valley in 1994. The data needed for the evaluation is currently being gathered. The results will be evaluated and incorporated into an overall method to determine those areas of the state were ground water is vulnerable to contamination from agricultural chemicals. The monitoring program can then target resources to those areas where attention is most needed. In addition this effort will be extremely valuable in the implementation of the State Management Plan for pesticides required by the Federal FIFRA act.

Update on collecting existing Ground Water Quality Data

In the FY-94 Memorandum of Understanding, the Ag Chemicals Program agreed to pursue collecting, evaluating, and entering into a database all existing ground water quality data available. Several studies of ground water quality in various regions of the state have recently become available. These include: North Front Range Water Quality Planning Association (over 300 wells in Weld County over a three year period 1989-1991); State Engineers Office (60 wells in southwestern Colorado in 1992); Colorado Oil and Gas Commission (324 samples, La Plata County, 1991); Colorado Department of Health (45 wells in the Delta-Montrose area in 1992, 30 wells in the San Luis Valley in 1990, 26 wells in the High Plains in 1989 and statewide monitoring data collected by the Haz. Mat. Division). All data from these studies has been collected and entered into a database specifically designed for this purpose. In addition, historical data from the U. S. Geological Survey and U. S. EPA is currently being entered.

The U. S. Geological Survey (USGS) is currently monitoring the South Platte and the San Luis Valley areas under the National Water Quality Assessment (NAWQA) program. As this data becomes available it will be incorporated into the final analysis for both areas. Several water conservancy districts are also actively engaged in collecting ground water quality data. Unfortunately, this data continues to remain unavailable due to concerns about privacy and future use of the data. The program hopes that as the monitoring effort continues and the agricultural community grows comfortable with our goals and intent, this valuable source of data will become available and enhance our understanding of the overall ground water quality of the state.

Other Activity

A long range sampling plan has been developed for the monitoring program. The plan covers three major types of ground water monitoring. The first type of monitoring is the initial screening surveys to be conducted on all major aquifers subject to contamination from agricultural chemicals. The screening surveys for the South Platte River alluvial aquifer, San Luis Valley unconfined aquifer, and the Arkansas River alluvial aquifer are complete. The second type of monitoring is a follow-up sampling program to resample,

for confirmation, all wells in which any contaminant was detected at a level of concern. Surrounding wells may also be sampled, if available, to determine if the contamination is widespread or only a localized problem. The third type of monitoring is the specialized sampling needed for evaluation of Best Management Practices or Agricultural Management Areas when established. The procedures for this type of monitoring are currently under development.

The program intends to include in its analysis of the study areas all available ground water quality data. Results from previous and ongoing studies in the South Platte River valley, San Luis Valley, and Arkansas River valley will be integrated into the final analysis for these areas.

Before an area is selected for monitoring, CDPHE will contact interested parties to inform them of the sampling program and SB 90-126, and how we envision its implementation. CDPHE will coordinate closely with federal agencies, county extension agents, conservancy districts, and local health officials in the project area.

Long Range Sampling Plan
Agricultural Chemicals Program

Short Term: (1 - 5 years)

Regional Baseline surveys

1) Major aquifers underlying an area of irrigated agriculture

South Platte Alluvial Aquifer system
Arkansas Alluvial Aquifer system
San Luis Valley unconfined aquifer
High Plains - Ogallala aquifer
Uncompahgre - Lower Colorado Alluvial Aquifer system

2) Major aquifers underlying urban areas

Denver Basin aquifer system
Fountain Creek
Cache la Poudre
Saint Charles Mesa

Mid Term: (3 - 7 years)

Begin follow-up surveys in those areas where base line survey suggest agricultural chemicals have impacted ground water

1) Increase sampling density to better define area of impact
2) Establish trend if any
3) Incorporate other water quality data into analysis

Begin planning for permanent monitoring network

Long Term: (5 years +)

Installing a permanent monitoring network

1) Low density control wells around the state
2) Medium density monitoring wells in areas of concern
3) High density monitoring wells within any designated AMA

APPENDIX IV

Colorado Department of Agriculture
Activities Report

Two projects encompassed the majority of the activities for the Department during 1994. These included the adoption of the rules and regulations for agricultural chemical bulk storage facilities and mixing and loading areas and the continuation of development of a state management plan for pesticides to meet EPA guidelines.

Rule and Regulation Development for Agricultural Chemical Bulk Storage Facilities and Mixing and Loading Areas

Section 25-8-205.5 (3)(b) of the Agricultural Chemicals and Groundwater Protection Act requires the Commissioner of Agriculture to develop regulations where pesticides and fertilizers are stored or handled in quantities that exceed the established thresholds. This task was completed in 1994. Details of the process utilized in developing the regulations with the exception of the activities at the public hearings was detailed in the 1993 report to the Legislature.

With significant input from the citizens advisory committee to the program, it was determined that a series of hearings should be held around the State in order to provide the maximum opportunity for people to comment on the proposed regulations. In January and February 1994, five public hearings were held. The schedule of the hearings and the attendance was as follows:

Date	Site	Attendance
January 31	Lamar	28
February 2	Alamosa	21
February 8	Grand Junction	7
February 23	Sterling	24
February 28	Lakewood	30

Also, written comments were received from six individuals.

The final hearing (Lakewood) was held in conjunction with a meeting of the advisory committee to allow members to hear first hand the comments on the proposed regulations. Following the hearing the committee discussed the comments received.

It was determined that several changes should be made. One of the issues that received several comments and resulted in the most significant change was the requirement that a Colorado registered engineer sign and seal the plans for construction. Many of the individuals offering comments felt this would be overly expensive for a small facility and in some more remote areas of the State a registered engineer may not be available. To address this issue, the requirement was changed to state a Colorado registered engineer must sign

and seal the plans or a set of generic plans from a source approved by the Commissioner of Agriculture must be utilized. Colorado State University Cooperative Extension and the Department of Agriculture are developing a set of generic plans for small to medium sized facilities that will be available early in 1995.

The advisory committee met again in June to finalize the changes to the proposed regulations. Following this, the proposed regulations were presented to the Colorado Agricultural Commission for their approval and then to the Commissioner for adoption. Commissioner Thomas A. Kourlis adopted the regulations on July 26, 1994 and the regulations became effective September 30, 1994.

Copies of the complete regulations and the summary sheet were mailed to all entities that had been identified as needing to comply with the regulations. Additionally, a press release was issued to provide notice that the regulations had been adopted and where information was available. A summary sheet for the regulations is included in Appendix I.

A series of presentations on the regulations has been initiated to provide information and to address compliance issues. These presentations are given to organizations and associations which have a substantial number of their members subject to the regulations. Hopefully, this educational process will aid individuals in determining first whether or not compliance with the regulations is required and secondly what specifically must be accomplished by when to meet the requirements. Four presentations have already been given and four more are scheduled in early 1995.

State Management Plans for Pesticides

In October of 1991, the EPA released their Pesticides and Ground-Water Strategy. The document describes the policies, management programs, and regulatory approaches that the EPA will use to protect the nation's groundwater resources from risk of contamination by pesticides. It emphasizes prevention over remedial treatment. The centerpiece of the Strategy is the development and implementation of State Management Plans (SMPs) for pesticides that pose a significant risk to groundwater resources.

The EPA will require an SMP for a specific pesticide if: (1) the Agency concludes from the evidence of a chemical's contamination potential that the pesticide "may cause unreasonable adverse effects to human health or the environment in the absence of effective local management measures; and (2) the Agency determines that, although labelling and restricted use classification measures are insufficient to ensure adequate protection of groundwater resources, national cancellation would not be necessary if the State assumes the management of the pesticide in sensitive areas to address effectively the contamination risk. If the EPA invokes the SMP approach for a pesticide, its legal sale and use would be restricted to States with an EPA-approved Pesticide SMP.

Therefore, to continue use of the pesticide in the State, the State must produce a management plan that defines its strategy to prevent the pesticide from impacting groundwater. This plan

must contain 12 components that the EPA has developed as part of the guidance document for the program. These range from the State's legal authority to regulate the pesticide, public participation, prevention actions to responses to detections of the pesticide in groundwater. Currently, it is believed the EPA will not require a Pesticide-Specific State Management Plan (PSMP) before 1996.

As a precursor to this action, Colorado has begun development of a generic state management plan that can be adapted as necessary to address specific pesticides that the EPA determines require a PSMP. As part of this process, the Department of Agriculture meets monthly with representatives of EPA to discuss issues involved in the development of the SMP. Several issues have been identified that need to be resolved. These are mainly concerning the components addressing how the state determines what regions of the state need to be addressed, groundwater monitoring and the state's response to detections of pesticides in groundwater.

There are two overriding concerns with the SMP program and EPA's strategy for implementation it. The first is that the program is extremely resource intensive. The second is that the flexibility originally designed into the program to allow States to use their discretion in handling detections of pesticides in groundwater or in addressing areas that are vulnerable to impact from pesticides has not developed. EPA appears to want to dictate many of the responses.

EPA released to the State a draft of the rule that would require the SMPs for specific pesticides. The Department of Agriculture submitted comments on the draft to EPA.

APPENDIX V

AGRICULTURAL CHEMICALS AND GROUNDWATER PROTECTION ACT
ADVISORY COMMITTEE 1994

Water Quality Control Commission

Mr. Roger Bill Mitchell
3914 N. Road 5 E
Monte Vista, CO 81144
(719) 852-2947

General Public

Ms. Tess Byler
5 Mountain Oak
Littleton, CO 80127
(H) (303) 933-7658
(W) (303) 771-0900

Ms. Barbara Taylor
853 Deer Trail Road
Boulder, CO 80302
(303) 444-9508

Commercial Applicators

Mr. Ray Edmiston
Aerial Sprayers, Inc.
5112 Weld County Road 32
Longmont, CO 80504
(303) 776-6240

Mr. Steven D. Geist
Swingle Tree Co.
8585 East Warren Avenue
Denver, CO 80231
(303) 337-6200

Green Industry

Mr. David Brown
Flatirons Golf Course
City of Boulder
P.O. Box 791
Boulder, CO 80306
(303) 443-5171

Mr. Mike Deardorff
KB Brighton
(Kitayama Brothers Greenhouse)
P.O Box 537
Brighton, CO 80601
(303) 659-8000

Ag Chemical Suppliers

Mr. Jim Klein
Centennial Ag Supply
P.O. Box 557
Kersey, CO 80644
(303) 353-2567

Mr. Wayne Gustafson
Agland, Inc.
P.O. Box 338
Eaton, CO 80615
(303) 454-3510

Producers

Mr. Mike Mitchell
1588 East Road 6 North
Monte Vista, CO 81144
(719) 852-3060

Mr. Les Yoshimoto
P.O. Box 82
Sedgwick, CO 80749
(303) 463-5769 or 463-8884

Mr. Max Smith
48940 Road X
Walsh, CO 81090
(719) 324-5743

Mr. Harry Talbott
3782 F 1/4 Road
Palisade, CO 81526
(303) 464-5943

Mr. Leon Zimbelman, Jr.
32637 WCR #10
Keenesburg, CO 80643
(303) 732-4662

Mr. Rob Sakata
P.O. Box 508
Brighton, CO 80601
(303) 659-1559

Mr. Jerry Mc Pherson
1312 Cedar Circle
Yuma, CO 80759
(303) 848-5339

Mr. John Hardwick
24700 County Road 19
Vernon, CO 80755
(303) 332-4211