WYOMING GENERIC STATE MANAGEMENT PLAN FOR PESTICIDES AND GROUND WATER

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Received Concurrence from
U.S. Environmental Protection Agency
October 1999

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ACKNOWLEDGMENTS

The Wyoming Department of Agriculture (WDA) thanks the following individuals and organizations for offering their technical assistance, expertise, and patience in developing the *Wyoming Generic State Management Plan for Pesticides and Ground Water* (SMP). Significant time and resources were provided by the following people:

Jim Bigelow, Wyoming Department of Agriculture
Kevin Frederick, Wyoming Department of Environmental Quality/Water Quality Division
E.J. Fanning, Wyoming Department of Environmental Quality/Water Quality Division
Rick March, Wyoming Department of Environmental Quality/Water Quality Division
Jake Strohman, Wyoming Department of Environmental Quality/Water Quality Division
Kevin Boyce, Wyoming State Engineer's Office
Doug Snyder, Sandoz Crop Protection Corporation
Garie Henry, Wyoming Farm Bureau Federation
John "Lars" Baker, Fremont County Weed and Pest Control
Tom Muhlbach, Wyoming Department of Agriculture
Ed Stearns, U.S. Environmental Protection Agency - Region 8
Carol Belew, U.S. Environmental Protection Agency - Region 8
Mike Wireman, U.S. Environmental Protection Agency - Region 8
Mark Ferrell, University of Wyoming Cooperative Extension Service
George Ritz, U.S. Geological Survey
Cheryl Eddy Miller, U.S. Geological Survey
Jack Pugsley, Lingle/Fort Laramie Conservation District
Randy Brown, U.S. Environmental Protection Agency - Region 8
Charles Hogelin, U.S. Department of Agriculture - Natural Resources Conservation Service
Cliff Byrd, U.S. Department of Agriculture - Natural Resources Conservation Service
Ken Hamilton, Wyoming Farm Bureau Federation
Jennifer Harris, U.S. Environmental Protection Agency - Region 8
Jack Dutra, Dow Elanco
Dennis Kelly, Ciba Plant Protection
Charles Rock, Ciba Plant Protection
Mary Halstvedt, Dow Elanco
Virginia Phillips, U.S. Environmental Protection Agency - Region 8
Dick Stockdale, Wyoming State Engineer's Office
Carl Classen, Wyoming Association of Municipalities
Norman DeMott, Goshen Irrigation District
P. Stan Mitchem, U.S. Department of Agriculture - Natural Resources Conservation Service
Grant Stumbough, Wyoming Department of Agriculture
Ken McMillan, Wyoming Department of Agriculture
John Baker, Wheat Marketing Commission
Melanie Clark, U.S. Geological Survey
Jeff Lundberg, Wyoming Ag-business Association
Bobbie Frank, Wyoming Association of Conservation Districts

Bill Monheiser, U.S. Environmental Protection Agency – Region 8
Dave Hogle, U.S. Environmental Protection Agency – Region 8
John Larson, U.S. Environmental Protection Agency – Region 8
Tim Osag, U.S. Environmental Protection Agency – Region 8
Mary Paxon, Field Representative for U.S. Senator Thomas
Dee Roedecker, Field Representative for U.S. Senator Enzi
Elaine McCauley, Field Representative for U.S. Congresswoman Cubin
Lisa Jarvis, Western Water Consultants, Inc.

Other individuals, agencies, and entities who participated in the review of the SMP include:

Garen Sailors, U.S. Department of Agriculture - Natural Resources Conservation Service
Steven Carlston, Energy Laboratories
Alan Kieper, Wyoming Groundskeepers and Growers
Steve Gloss, Wyoming Water Resources Center
Don Rolston, Wyoming Department of Agriculture
Ray Brubaker, U.S. Department of the Interior - Bureau of Land Management
Tony Jolovich, Nonpoint Source Task Force
Roy Rankin, U.S. Department of the Interior - National Park Service
Fred Lamming, Wyoming Weed and Pest Council
Robert Johnson, Wyoming Water Development Association
Edward Norlin, Shoshoni Heart Mountain Irrigation District, Nonpoint Source Task Force
Stephanie Kessler, Wyoming Outdoor Council
Duane Klamm, U.S. Department of Agriculture - Natural Resources Conservation Service
Ron Groskopf, Zeneca
Chessie Lee, Powder River Basin Resource Council
Rodney Pfister, Nonpoint Source Task Force
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Lloyd Eisenhauer, Nonpoint Source Task Force
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Shane Smith, City of Cheyenne Botanical Gardens
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Carolyn Paseneaux, Wyoming Wool Growers Association
Curtis O'Neil, U.S. Department of Agriculture - Forest Service
Al Gale, Agricultural Experimental Station, University of Wyoming College of Agriculture
Ken Weekes, Wyoming Agri-Business Association
Steve Muench, Monsanto Chemical Company
Fred Eales, Trout Unlimited
Karen Fethkenher, Wyoming Rural Electric Association
Dawn Brown, Sandoz Agro, Incorporated
William Franks, Goshen Irrigation District
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Kaiser Farms
Harold Hellbaum, U.S. Department of Agriculture - Consolidated Farm Service Agency
Kate Smith, Wyoming's Cow-Belles
Richard Coulter, Wyoming Agriculture Statistics Service
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Jeff Fassett, Wyoming State Engineer's Office
Dan Mika, Nonpoint Source Task Force
Larry Means, Nonpoint Source Task Force
David Olson, Inter-mountain Laboratories, Inc.
Jay Stender, Inter-mountain Laboratories, Inc.
Marty Griffith, U.S. Department of the Interior-Bureau of Land Management
Rick Schuler, U.S. Department of the Interior-Bureau of Land Management
U.S. Environmental Protection Agency - Public Water Supply Program

INTRODUCTION

The detection of pesticides in ground water in the U.S. is being reported with increasing frequency. Pesticides in ground water can result in significant risks to health and the environment in areas where drinking water wells are contaminated. And, once ground water is contaminated, it can be difficult and expensive to rectify.

Pesticides and Ground-water Strategy

Since 1986, the U.S. Environmental Protection Agency (EPA) has been developing a strategy to address the problem of ground-water contamination by pesticides and other agricultural chemicals. The EPA completed the "Pesticides and Ground-water Strategy" in October 1991. The strategy describes how the EPA currently uses and intends to use its pesticide regulatory authorities under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) to protect ground water. The strategy also describes a new federal-state partnership approach for addressing unreasonable risks from ground-water contamination by the use of pesticides.

Until the development of the strategy, the EPA's policy for pesticides that pose a threat to ground water, despite national labeling and restricted use designations, may have been to cancel the pesticides nationally (in the case of pesticides currently in use), or not register the pesticides (for pesticides not yet in use). However, national prohibition based on a national risk/benefit assessment may not always fully consider local variability of the use, value, and vulnerability of ground water. Therefore, the goal of the strategy is to provide individual states with the opportunity to manage the use of pesticides in ways that protect ground-water resources.

State Management Plans

Development of state management plans (SMPs) will allow continued use of pesticides that might otherwise be unavailable due to cancellation of the federal registration over ground-water contamination concerns. Through the voluntary implementation of SMPs, states will promote the environmentally sound management of pesticides that might otherwise pose an unreasonable risk to ground-water resources.

Two provisions of the FIFRA support the use of SMPs as a condition of initial registration, continued registration, or legal availability of a pesticide; 1) the restricted use provision under Section 3, and 2) the cancellation provision under Section 6. Under Section 3, "other regulatory restrictions" authority, the EPA would undertake a rulemaking, with publication in the Federal Register, of the details of the proposed action and opportunity for public comment, to classify one or more pesticides for restricted use. SMPs would be specified as part of the restrictions required. The basis for the action is a determination that the reduction in risk outweighs the decrease in benefits imposed by restrictions.

The Section 6 approach is to propose cancellation of the pesticide, unless there is an approved SMP in place. The basis for the action is a determination that as the pesticide is currently used its risks outweigh benefits and cancellation is warranted. However, use under an approved SMP is found to have an acceptable balance of benefits over risks.

In actions under either Section 3 or Section 6, the SMP requirement is referenced on the product label, so the product can be legally sold and used only in states with an approved SMP.

Types of State Management Plans

There are two types of SMPs; 1) generic pesticide SMPs, and 2) pesticide-specific SMPs.

States are strongly encouraged to voluntarily develop generic pesticide SMPs before the EPA requires pesticide-specific SMPs through a chemical-specific regulatory action. Development of a generic pesticide SMP, acceptable to the EPA, will help insure the continued availability of a pesticide of concern.

Generic Pesticide State Management Plans

In a generic pesticide SMP, a state must address each of the following twelve components in generalized terms (i.e., not specific to a particular pesticide):

1. State's Philosophy and Goals toward Protecting Ground Water;
2. Roles and Responsibilities of State Agencies;
3. Legal Authority;
4. Resources;
5. Basis for Assessment and Planning;
6. Monitoring;
7. Prevention Actions;
8. Response to Detections of Pesticides;
9. Enforcement Mechanisms;
10. Public Awareness and Participation;

11. Information Dissemination; and

12. Records and Reporting.

The extent to which each component is addressed depends on each state's unique hydrogeologic and institutional characteristics, including its ground-water protection philosophy, aquifer sensitivity, the degree of pesticide use, agronomic practices, and the use, value and vulnerability of ground water.

The EPA does not require generic pesticide SMPs be submitted for concurrence. However, the EPA strongly encourages states to seek review, comment, and concurrence on their generic pesticide SMPs. This not only facilitates the EPA's review of future pesticide-specific SMPs, but will also insure states have adequate time to develop pesticide-specific information within the time allowed once a pesticide is identified as requiring an approved pesticide-specific SMP for continued use. If a state is required to have an approved pesticide-specific SMP and fails to gain approval, legal sale and use of that pesticide within the state will not be permitted.

Pesticide-specific State Management Plans

As with generic pesticide SMPs, pesticide-specific SMPs must also address each of the twelve components. However, a pesticide-specific SMP should contain all the information appropriate to the generic pesticide SMP (i.e., generic information not specific to a particular pesticide), plus information specific to the pesticide of concern. Additionally, the pesticide-specific SMP must demonstrate that a state's programs are in place and operating to protect ground water from pesticide contamination.

The EPA will require a state to prepare a pesticide-specific SMP if they:

- conclude 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

- determine, that although labeling and restricted use classification measures are not enough to assure adequate protection of ground-water resources, national cancellation would not be necessary if states assume management of the pesticide in sensitive areas to effectively address the contamination risk.

If the EPA invokes the SMP approach for a specific pesticide, its legal sale and use would be confined to states with an EPA-approved pesticide-specific SMP.

Wyoming's Generic Pesticide State Management Plan

Objectives

The objectives of Wyoming's generic pesticide SMP are:

- to facilitate the timely and cost-effective development of future pesticide-specific SMPs expected to be required by the EPA; and

- to illustrate the respective responsibilities and interactions among various state agencies in Wyoming with respect to pesticides in order to enhance better coordination of management activities.

Development

The Wyoming Department of Agriculture (WDA) is the lead agency in directing Wyoming's effort to develop a generic pesticide SMP. The WDA contracted with a Wyoming environmental consulting firm, Western Water Consultants, Inc., to assist in the coordination and development of the SMP.

Realizing the success of Wyoming's generic pesticide SMP depends on the voluntary implementation of the plan by both users and applicators, the WDA insured the public's participation and input in the development of the generic pesticide SMP, by inviting approximately 100 representatives from various state and federal agencies, the Wyoming Department of Environmental Quality (WDEQ), the Governor's Nonpoint Source Task Force, EPA - Region 8, the pesticide industry, applicators, environmental organizations, agricultural organizations, individuals impacted by pesticide use, and the general public, to voluntarily participate in the development of the SMP. Each individual chose whether he/she would like to participate 1) on the Ground-water and Pesticides Strategy Committee (GPSC) which was responsible for the actual development of the SMP, or 2) on the GPSC "Advisory Group" which was responsible for reviewing and editing each portion of the SMP as it was developed. Individuals who chose to participate on the GPSC are listed in Appendix A; those who participated on the GPSC "Advisory Group" are listed in Appendix B. The SMP was subjected to additional public review and comment prior to submittal of the SMP to the EPA. The SMP was placed in public-accessible locations, and public notices were placed in widely circulated trade publications and newspapers to alert the public of the availability of the SMP for review and comment.

Pesticide-specific State Management Plan

If EPA requests Wyoming submit a pesticide-specific SMP in the future, appropriate pesticide-specific information will be added to this generic pesticide SMP. The SMP will then be submitted to the EPA for their review and approval. Approval of the pesticide-specific SMP by the EPA will insure Wyoming maintains the registered use of pesticides.

STATE'S PHILOSOPHY AND GOALS TOWARD PROTECTING GROUND WATER

Wyoming's Philosophy Toward Protecting Ground Water

The philosophy of the *Wyoming Generic State Management Plan for Pesticides and Ground Water* (SMP) is to manage the legal use of pesticides in order to prevent adverse effects on human health and the environment, and to protect the environmental integrity of Wyoming's ground-water resources. Preventing unacceptable contamination from pesticides rather than relying on remediation is a primary part of this goal.

The SMP will serve as a coordination mechanism between all responsible agencies, and will provide specific responses when it becomes necessary to develop a pesticide-specific SMP. Efforts that will be implemented under this plan will be designed to 1) protect ground water from pesticide contamination, 2) not impair existing and potential ground-water use classifications, and 3) insure overall ground-water quality is maintained, and in some cases, improved.

The following principles govern the SMP:

1. Ground-water resources are beneficial and important to the economy of Wyoming. State and federal law mandates pesticide use and practices shall not impair any present or potential future use of ground water or cause a public health hazard. Proper management of pesticides through use of the SMP should result in the prevention of unreasonable risks to human health and beneficial ground-water use.

2. When pesticide contamination of ground water is the result of activity in violation of existing state laws (e.g. misuse, spills, back siphoning, soil loading with pesticides at mixing sites, etc.), the responsible party(ies) will be subject to regulatory enforcement action by the WDA and/or the WDEQ/WQD.

3. Pesticides are beneficial and important to the economy of Wyoming. The SMP should provide a framework that will protect ground water from pesticide contamination but still allow existing and future beneficial use of pesticides.

4. Public participation is an integral part of the development, implementation and success of the SMP.

5. Educational programs for, and voluntary implementation of, Best Management Practices (BMPs) by end-users are integral components of the SMP.

6. In an attempt to effectively utilize resources, ground-water quality monitoring for pesticides will be prioritized in areas of the state where ground water is most vulnerable to contamination.

7. The degree of involvement of local governments in implementing the prevention elements of the SMP will vary considerably, based on available resources, aquifer sensitivity, ground-water vulnerability, type of local government, and the presence of existing local programs.

Wyoming's Goals for Protecting Ground Water

The State of Wyoming protects all ground water within the state's boundaries. All ground water that is currently used, or reasonably expected to be used as a drinking water supply (including ground water that is closely hydrologically connected to surface water) is protected to the Safe Drinking Water standard (i.e. the maximum contaminant level (MCL) for a specific pesticide, or its equivalent).

Wyoming's Ground-water Quality Standards protect ground-water use and potential use for which it is suitable. The federal Safe Drinking Water Act (SDWA) establishes MCLs for certain pesticides (Appendix C, Table C-1; Appendix H). Normally, MCLs are used unless other scientific information would necessitate a change in the MCL value. Where an MCL is not provided, the Administrator of the Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD) has the authority to establish ground-water quality standards which will not impair the water for its use suitability or which may contribute to a condition in contravention of ground-water quality standards or to any toxic or hazardous effect to natural biota. The WDEQ's method of determining ground-water quality standards is described in Appendix C.

ROLES AND RESPONSIBILITIES OF STATE AGENCIES

Introduction

The goal of the *Wyoming Generic State Management Plan for Pesticides and Ground Water* (SMP) is to manage the use of pesticides to prevent adverse effects on human health and the environment, and to protect the environmental integrity of Wyoming's ground-water resources.

Agencies at the federal, state, and local levels of government, together with registrants, commodity groups, and various trade organizations, currently play a role in the SMP. With a cooperative approach, these groups can work together with the agricultural community to develop and implement an effective SMP.

Roles and Responsibilities of State Agencies

Several state agencies are responsible for the actual development and implementation (including enforcement) of the SMP. These agencies are shown on Figure 2-1 and are listed below.

- Wyoming Department of Agriculture (WDA);
- Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD);
- Wyoming State Engineer's Office (SEO);
- University of Wyoming Cooperative Extension Service (UW - CES); and
- Spatial Data and Visualization Center (SDVC) (see Figure 2-1).

The general roles and responsibilities of each state agency are described below. Each agency's responsibilities are summarized on Table 2-1.

Wyoming Department of Agriculture

The WDA is the lead agency for administering the Wyoming Environmental Pesticide Control Act of 1973. The WDA will:

- Serve as the primary state agency in coordinating efforts to develop and implement a comprehensive SMP to prevent ground-water contamination by pesticides;
- Co-chair the Ground-water Pesticides and Strategy Committee (GPSC);

FIGURE 2-1 - LOCAL, STATE, AND FEDERAL AGENCIES WITH A ROLE IN THE STATE MANAGEMENT PLAN

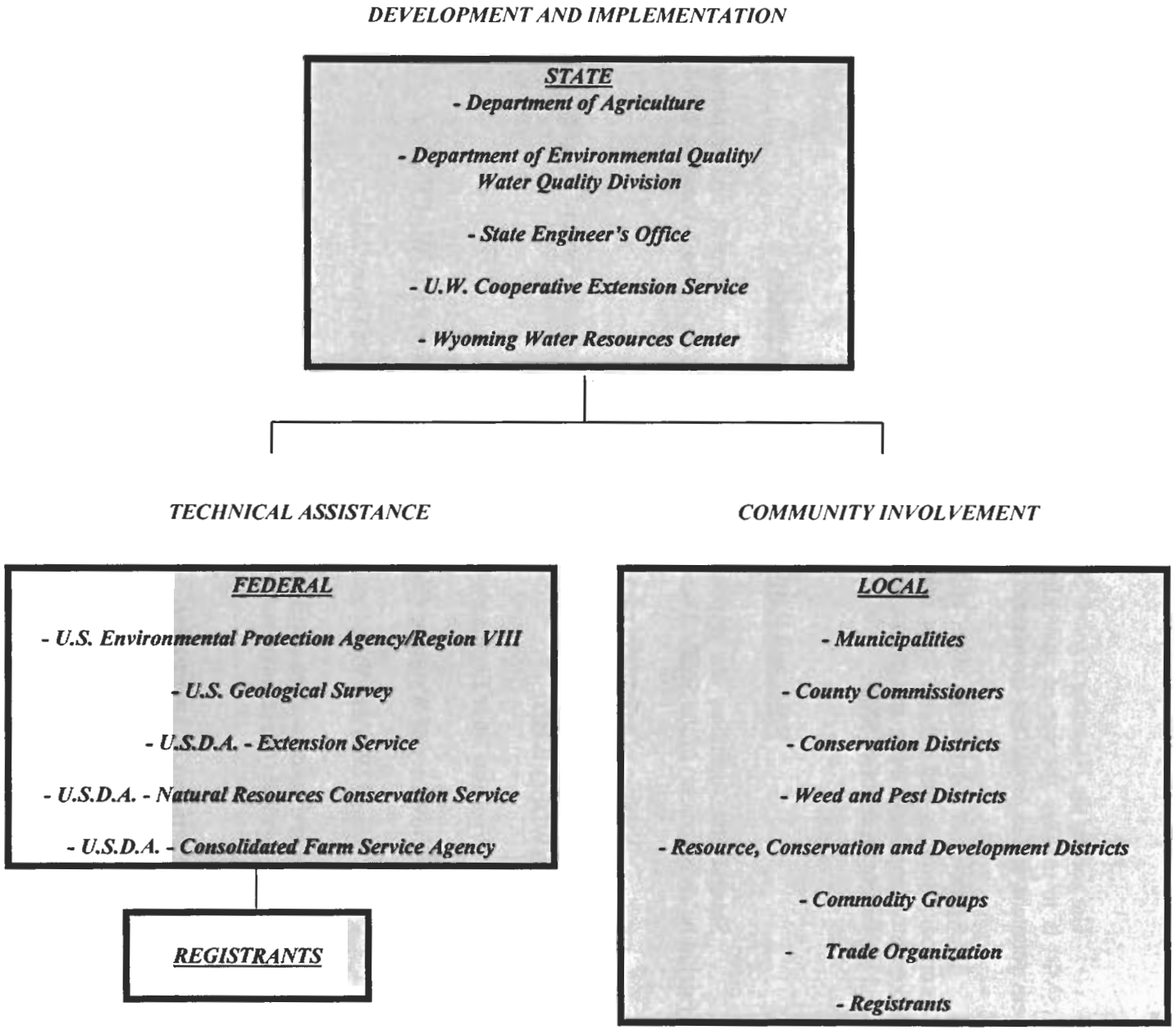


TABLE 2-1 - RESPONSIBILITIES OF STATE AGENCIES

RESPONSIBILITIES	STATE AGENCY
Development and Implementation of SMP	WDA, WDEQ, SEO, UW-CES, SDVC
Pesticide Product Information	WDA, UW-CES
Ground-Water Monitoring	WDA, WDEQ, SEO
Technical Assistance	WDA, WDEQ, SEO, UW-CES, SDVC
Site Investigations	WDA, WDEQ, SEO
Aquifer Sensitivity and Ground-Water Vulnerability Assessments	WDA, WDEQ, SDVC
Applicator Training & Certification	WDA, UW-CES
Public Education	WDA, WDEQ, SEO, UW-CES, SDVC
Enforcement	WDA, WDEQ, SEO
Remediation	WDEQ
BMP Development	WDA, UW-CES
Prevention Measures	WDA, WDEQ, SEO, UW-CES, SDVC
Record Keeping & Reporting	WDA, WDEQ, SEO
Response to Pesticide Detections	WDA, WDEQ

Abbreviations:

WDA: Wyoming Department of Agriculture
WDEQ: Wyoming Department of Environmental Quality/Water Quality Division
SEO: Wyoming State Engineer's Office
UW-CES: University of Wyoming - Cooperative Extension Service
SDVC: Spatial Data and Visualization Center

- Insure the SMP is subjected to rigorous public review and comment during development;

    - Enforce violations of the Environmental Pesticide Control Act of 1973;

    - Provide pesticide applicator training and certification;

    - Respond to pesticide detections in ground water;

    - Conduct investigations of ground-water contamination from pesticides to determine source(s) and responsible parties;

    - Utilize available aquifer sensitivity and ground-water vulnerability mapping and pesticide use data to develop a ground-water monitoring program consistent with the goals of the SMP;

    - Provide an annual assessment of the ground-water monitoring program;

    - Participate in the development and implementation of pesticide management zones (PMZs);

    - Develop and disseminate information on Best Management Practices (BMPs);

    - Provide pesticide product information, technical and educational assistance to state agencies, regulated parties, and the general public on how to protect ground-water resources from pesticides;

    - Gather pesticide use and volume data by conducting annual record call-ins from dealers and commercial applicators of restricted-use pesticides for areas with sensitive aquifers or vulnerable ground water;

    - Assist in the development and interpretation of aquifer sensitivity and ground-water vulnerability maps;

    - Pursue various sources of federal funding to support the development and implementation of the SMP;

    - Assist Wyoming's thirty-four conservation districts in planning and application of conservation practices in both agricultural and urban areas, and coordinating nonpoint source pollution prevention programs; and

    - Report ground-water monitoring data to the U.S. Environmental Protection Agency (EPA) in accordance with the SMP.

Wyoming Department of Environmental Quality/Water Quality Division

The WDEQ/WQD is the lead agency for Water Quality Management (surface and ground water) in the state of Wyoming. The WDEQ/WQD will:

- Serve as one of the state agencies responsible for the development and implementation of a comprehensive SMP to prevent ground-water contamination by pesticides;

- Co-chair the GPSC;

- Insure the SMP is subjected to rigorous public review and comment during development as required by the Wyoming Environmental Quality Act and the Wyoming Administrative Procedures Act;

- Enforce violations of Wyoming Ground-water Quality Standards;

- Establish ground-water quality standards to protect human health and the environment in the absence of a federal standard;

- Respond to the detection of pesticides in ground water;

- Conduct investigations of ground-water contamination from pesticides to determine source(s) and responsible parties;

- Provide technical assistance in defining management areas for pesticide use;

- Assist in the development and interpretation of aquifer sensitivity and ground-water vulnerability mapping;

- Assist in the design and implementation of ground-water monitoring programs for pesticides;

- Participate in the development and implementation of pesticide management zones (PMZs);

- Provide technical and educational assistance to develop effective local wellhead protection programs;

- Provide technical and educational assistance to state agencies, regulated parties, and the general public on how to protect ground-water resources from pesticides;

- Provide support to WDA in the development of an annual assessment of the ground-water monitoring program;

- Pursue funding through the Clean Water Act, Section 319 Nonpoint Source Program for ground-water monitoring activities (with EPA - Region 8 oversight);

- Evaluate and review monitoring well and public water supply well construction; and

- Recommend treatment processes to insure a potable water supply.

Wyoming State Engineer's Office

The Wyoming Constitution declares all waters within the exterior boundaries of the state to be property of the state, and grants general supervision of those waters to the State Engineer. The SEO will:

- Serve as one of the state agencies responsible for the development and implementation of a comprehensive SMP to prevent ground-water contamination by pesticides;

- Assist in the design and implementation of ground-water monitoring programs for pesticides;

- Maintain a well inventory data base of significant information (well location, total depth, static water level, producing zone(s), etc.) selected from permit records;

- Evaluate and review water well construction and enforce the Water Well Minimum Construction Standards (Part III, SEO regulations);

- Provide an annual assessment of the ground-water monitoring program;

- Work in association with other agencies or entities investigating ground-water conditions, and promulgate rules and regulations necessary to carry out these duties; and

- Where BMPs or alleviation efforts, prescribed under the SMP, are determined to directly or indirectly infringe upon, or interfere with, a valid water right/appropriation, the assessment of the conflict from the water rights perspective would become the responsibility of the State Engineer. As such, any water rights ramifications resulting from imposition of this plan would be taken under consideration by the State Engineer upon advisement and consultation with the lead agencies.

University of Wyoming Cooperative Extension Service

The UW - CES will:

- Serve as one of the state agencies responsible for the development and implementation of a comprehensive SMP to prevent ground-water contamination by pesticides;

- Assist in the design and implementation of ground-water monitoring programs for pesticides;

- Provide pesticide applicator training and certification;

- Develop and disseminate information on Best Management Practices (BMPs);

- Assist in communicating the requirements of the SMP at the local level, and provide education and training to local users;

- Provide technical and educational assistance to state agencies, regulated parties, and the general public on how to protect ground-water resources from pesticides;

- Compile pesticide use data;

- Assist in identifying potential cooperators in any monitoring programs conducted as part of the SMP;

- Develop information on alternative pest management technologies; and

- Provide Integrated Pest Management (IPM) services and advice.

Spatial Data and Visualization Center

The SDVC will:

- Serve as one of the state agencies responsible for the development and implementation of a comprehensive SMP to prevent ground-water contamination by pesticides;

- Assist in the design and implementation of ground-water monitoring programs for pesticides;

- Develop and interpret aquifer sensitivity/ground-water vulnerability maps for each Wyoming county;

- Make aquifer sensitivity/ground-water vulnerability maps available to the public through city and county planning offices, local Conservation District offices, and the University of Wyoming - Extension Service (UW-CES) field offices;

- Maintain all aquifer sensitivity/ground-water vulnerability mapping project data on the water resources data system, at the SDVC's Laramie, Wyoming office;

- Continue developing aquifer sensitivity and ground-water vulnerability data, depending upon available resources; and

- Serve as the electronic repository for ground-water quality data.

Federal Agencies' Roles in the SMP

The WDA, WDEQ/WQD, SEO, UW - CES and SDVC will use the programs and expertise of federal agencies in carrying out the SMP (Figure 2-1). Following is a brief description of the technical assistance available from these agencies.

EPA

The *Ground-water Unit* will:

- Continue to fund the WDEQ/WQD to assist in the development and implementation of a ground-water management plan through Clean Water Act Section 106 funds and track activities in the state/EPA agreement;

- Continue participation in the existing cooperative agreement to develop aquifer sensitivity/ground-water vulnerability maps for Wyoming counties;

- The EPA's Ground-water Protection Division and Office of Pesticide Programs is currently preparing a technical assistance document (TAD) entitled, "Methods for Assessing Aquifer Sensitivity and Ground-water Vulnerability to Pesticide Contamination" relative to "Basis for Assessment and Planning";

- Provide technical assistance on methodologies used for the design of the state ground-water monitoring program;

- Continue assisting the state in identifying appropriate educational programs and BMPs for inclusion in the SMP;

- Attempt to secure funding to further the state's nonregulatory approach to ground-water protection from pesticides; and

- Continue to provide technology transfer on pertinent projects, and assist in outreach activities as necessary.

The *Pesticide Program* will:

- Continue to take uniform action for pesticides posing wide-spread, national concerns, and will establish generic prevention measures to address certain pesticide use and disposal practices that pose unique ground-water threats independent of local vulnerability;

- Encourage the development of a strong state role in local management of pesticide use to protect the ground-water resource;

- Provide users with information and training materials, as they are developed, to enable users to make environmentally sound decisions;

- Encourage registrant's responsibilities to increase in two areas; 1) technical support for the user in the field, and 2) limited ground-water monitoring to insure the adequacy of pesticide-specific SMPs in protecting ground water;

- Use the EPA-specific protection criteria as reference points to evaluate, and when necessary, change SMPs; and

- Provide funding to the WDA to assist in the development of the SMP, as budgets allow.

The *Safe Drinking Water Program* will:

- Administer the Safe Drinking Water Act (SDWA) program to protect public water supplies utilizing ground-water resources;

- Promulgate maximum contaminant levels (MCLs) for drinking water; and

- Maintain ground-water quality data on STORET (data for non-regulatory basis) and SDWIS (Safe Drinking Water Information System) databases.

The *Wyoming Direct Implementation Team* will:

- Maintain the Safe Drinking Water Information System (SDWIS) database, which contains finished water (i.e. treated) analytical results for all public water systems that have exceeded EPA drinking water standards; and

- Maintain the Drinking Water Compliance Tracking System (CTS). This system, while feeding only violation data into SDWIS, maintains the analytical results for all finished water analyses performed on Wyoming public water systems (PWSs) (Schmidt, 1996).

The *Municipal Systems Program* will:

- Share monitoring data from public water supply systems with the state agencies responsible for development and implementation of the SMP;

- Participate on the GPSC; and

- Play a role in SMP promotion, coordination, and/or public education among public water systems.

The *Nonpoint Source Program* will continue to provide funding and project oversight on all nonpoint source projects funded under Section 319.

U.S. Geological Survey

The U.S. Geological Survey (USGS) may:

- Assist in determining priority monitoring locations;

- Provide information related to aquifer location, depth, flow direction and speed for Wyoming aquifers; detailed hydrologic and geologic maps and studies for sensitivity determinations; and mapping of major ground-water recharge areas in Wyoming;

- Assist with compiling aquifer sensitivity and ground-water vulnerabilty data;

- Assist WDA and WDEQ/WQD in the design and implementation of the baseline monitoring program;

- Evaluate and review well construction prior to inclusion in the monitoring system;

- Collect ground-water samples using protocols and equipment approved by the WDA and WDEQ/WQD for pesticide sampling;

- Analyze ground-water samples for pesticides using laboratory methodologies approved by the WDA and WDEQ/WQD and in compliance with accepted quality assurance/quality control (QA/QC) protocols;

- Forward all data from chemical analysis of samples collected for pesticide determination to appropriate personnel within the WDA and the WDEQ/WQD as the analytical results are received by the USGS from the laboratory; and

- Together with the WDA, WDEQ/WQD, and SEO, provide an annual assessment of the ground-water monitoring program.

U.S. Department of Agriculture - Extension Service

The U.S. Department of Agriculture - Extension Service (USDA - ES) will:

- Participate in the application of research-generated knowledge and leadership techniques;

- Participate in information dissemination;

- Develop information on alternative pest management technologies;

- Deliver educational and training programs to promote proper pesticide use; and

- Provide Integrated Pest Management (IPM) services and advice.

U.S. Department of Agriculture - Natural Resources Conservation Service

The U.S. Department of Agriculture - Natural Resources Conservation Service (NRCS) will:

- Provide updated agronomic and soils data;

- Assist in identifying potential cooperators in any monitoring programs conducted as part of the SMP;

- Assist in communicating SMP restrictions to pesticide users;

- Assist the GPSC in developing and implementing pesticide BMPs;

- Provide direct technical assistance to landowners in designing and carrying out plans for conserving soil and protecting water quality and quantity;

- Provide technical assistance in identifying and describing soil map units that are at greater risk to pesticide leaching; and

- Assist private land users in evaluating the pollution potential of various pesticides from surface runoff and deep leaching (Lon Young, 1992).

U.S. Department of Agriculture - Consolidated Farm Service Agency

The U.S. Department of Agriculture - Consolidated Farm Service Agency (CFSA) will:

- Develop quantifiable data that can be collected to provide a better tool for monitoring and evaluating efforts to control nonpoint sources;

- Use data from the Rural Clean Water Program, including several projects with ground-water quality components, to aid in evaluating the effectiveness of BMPs (EPA, 1992a);

- Assist in identifying potential cooperators in monitoring programs conducted as part of the SMP;

- Assist in communicating SMP restrictions and provide technical assistance to pesticide users; and

- Provide crop, soil, and land use information and maps for aquifer sensitivity and ground-water vulnerability determinations.

Local Governments' Role in the SMP

Local governments can play a beneficial role in protecting ground water through implementation of the SMP. Since local governments are already involved in other water quality programs, (e.g., Wellhead Protection Programs), they can support state efforts in information dissemination, and public education and outreach. Local governments can support the SMP through land use controls such as storage and disposal restrictions. Local governments might also be able to provide technical assistance to well owners and operators to control direct sources of ground-water contamination through wells.

The degree of involvement of local governments in implementing the prevention elements of the SMP will vary considerably based on available resources, aquifer sensitivity, ground-water vulnerability, type of local government, and the presence of existing local programs. When local governments are given, or have authority to address, state ground-water related objectives and priorities, coordination, and/or guidance will be provided by participating agencies.

Representatives of local government that have actively participated in the development of the SMP, and that will participate in the implementation of the SMP on a local level, include:

- Wyoming Association of Municipalities;
- Wyoming County Commissioners Association;
- Local Conservation Districts;
- Local Weed and Pest Districts; and
- Resource, Conservation and Development Districts (see Figure 2-1).

Conservation Districts

Wyoming's local Conservation Districts may assist in organizing ground-water monitoring programs at the local levels. Conservation Districts will be instrumental in providing technical assistance, identifying potential cooperators, obtaining access agreements from cooperators, and scheduling local meetings.

Weed and Pest Districts

Wyoming's Weed and Pest Districts will:

- Provide pesticide use data;
- Work with the WDA and the WDEQ/WQD to develop informational and educational materials based on knowledge gained from ground-water quality protection demonstration projects;
- Assemble and distribute technical information generated by public agencies, industry, and universities which can lead to development and implementation of BMPs;
- Provide advice on pest control and individual pesticides, and provide IPM services and advice; and
- Develop information on alternative pest management technologies.

Registrants' Role in the SMP

Manufacturers or formulators of pesticides are responsible for registering their product with the WDA and paying annual registration fees. The registrant must provide the WDA with 1) the name and address of the applicant and the name and address of the person whose name will appear

on the label, 2) the name of the pesticide, and 3) the use classification as provided in the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). The Director of the WDA may require the registrant provide a full description of tests and results upon which the claims are based for any pesticide on which registrations are being considered.

If the EPA or the WDA requires a pesticide-specific SMP, registrants may be required to submit a pesticide-specific SMP to the WDA for consideration. Registrants will be expected to provide supporting strategies for a pesticide-specific SMP, an outreach program, informational materials, suggestions regarding possible pesticide-specific SMP focus in vulnerable areas where the product is used or likely to be used, and suggestions on the need for specific monitoring of the pesticide in these areas.

Where ground-water monitoring is determined to be necessary as a component of a pesticide-specific SMP, the registrant is expected to 1) assess the likelihood of the pesticide to impact ground-water quality, and 2) provide sufficient scientific data to the EPA. The data should be extrapolated to the general use conditions of the state, supporting laboratory procedures, methods and standards. Registrants are also expected to provide ground-water monitoring data results from studies conducted by the registrant in Wyoming or in other states if requested by the WDA. Registrants may also be required to conduct ground-water monitoring in accordance with the requirements of a given pesticide-specific SMP.

Registrants are expected to promote voluntary pesticide BMPs to avoid or minimize impact of product use on ground water, and to take a leadership role in stewarding the use of their products to prevent their presence in ground water. Registrant's efforts should supplement and complement the efforts of the WDA and the UW - CES.

Additionally, registrants may:

- Provide technical support to the WDA, WDEQ/WQD, and SEO for water quality protection in response to pesticide detections in ground water;

- Be required to implement a ground-water monitoring program, investigation, and/or cleanup program for their specific product if the applicator uses the product according to labels and BMPs and ground-water quality is still affected;

- Review ground-water monitoring data with the WDA, WDEQ/WQD and SEO;

- Comment on proposed water quality research, reports, quality assurance project plans, and ground-water monitoring well siting plans;

- Assist in targeting vulnerable ground-water areas for prevention or monitoring activities;

- Provide a map of the product's primary distribution within the state to assist in pesticide use evaluations;

- Provide methodology for analysis of pesticides in ground water when information is not currently available;

- Provide expertise on sampling methodology;

- Provide information on how registrant funding could help support long and short term monitoring, prevention, and response activities with state agencies;

- Provide a listing of all registrant-supported water quality research/demonstration/ prevention/abatement activities within the state;

- Perform economic analyses to demonstrate the state's benefit for allowing continued use of a product in marginal yield or vulnerable ground-water settings;

- Interface and provide support to grower groups, universities, private consultants, etc., on SMP administration and enhancement;

- Provide a spokesperson at public meetings to introduce the SMP;

- Provide a listing of registrant-produced educational materials and comment on how the materials can be disseminated to the appropriate audience;

- Interface and provide support to grower groups, universities, private consultants, etc., on SMP administration and enhancement;

- Produce informational brochures explaining the SMP to dealers, custom applicators, and certified applicators;

- Provide training to registrant personnel (e.g., sales and distribution personnel) and enhance their ability to serve as information resources; and

- Assist pesticide users in the proper, environmentally sound application of their products. Registrants will assume a greater commitment to "product stewardship" by informing and training distributors and applicators on how their products should be managed to prevent degradation of ground-water quality.

Commodity Groups' and Trade Organizations' Role in the SMP

Commodity groups and trade organizations are vital to the implementation and effectiveness of the SMP. In order to implement a voluntary program, it is essential to gain the support of these

groups. It is through their encouragement and education that the SMP will be implemented most effectively.

State of Wyoming/EPA - Region 8 Liaison

The WDA's Technical Services Manager will serve as liaison between the State of Wyoming and the EPA - Region 8. The liaison will serve as a single contact point for all formal communications concerning the SMP process between the state and EPA. The liaison will be responsible for the transmittal and receipt of official correspondence and information.

The Technical Services Manager can be reached at:

Wyoming Department of Agriculture
2219 Carey Avenue
Cheyenne, Wyoming 82002
Telephone: 307/777-6590
FAX: 307/777-6593

Coordination Mechanisms

The GPSC was created specifically to coordinate the development and implementation of the generic SMP and the future development and implementation of the pesticide-specific SMPs. Environmental and nonagricultural, as well as agricultural interests are represented by the GPSC so no group/interest can consistently influence the development of the SMP. The composition of the GPSC is detailed in the "Introduction" section of this SMP. The WDA and WDEQ both co-chair the GPSC. Both agencies will be responsible for receiving and disseminating information concerning plan development and implementation to all participating agencies. The WDA and WDEQ will be responsible for the activities of the GPSC, and coordinating the activities of the cooperating agencies and other entities in the development and implementation of the SMP. The WDA and WDEQ co-chairs will also be responsible for communication with the EPA regarding SMP-related activities.

The SMP was prepared by the GPSC, and was submitted for public review.

Additional Coordination Mechanisms

Additional Memoranda of Understanding (MOUs) and coordination mechanisms allow the state agencies responsible for development and implementation of an effective SMP to work together to protect the environmental integrity of Wyoming's ground-water resources:

- W.S. §35-7-368 authorizes the Director of the *WDA* to cooperate with, and enter into agreements with, any other Wyoming state agency or other state or federal agency for the purpose of carrying out the provisions of the Wyoming Environmental Pesticide Control Act and securing uniformity of regulation;

- W.S. §35-11-109(a)(iii) and (viii) provides the Director of the *WDEQ* with the authority to secure intergovernmental cooperation in implementing a ground-water management plan. W.S. §35-11-114 also states:

  > the Water Quality Advisory Board shall recommend to the Environmental Quality Council through the WDEQ/WQD Administrator and WDEQ Director, comprehensive plans and programs for the prevention, control and abatement of air, water and land pollution and the protection of public water supplies; and
  >
  > the advisory board shall recommend to the council through the Administrator and Director, the adoption of rules, regulations and standards to implement and carry out the provisions and purposes of the Wyoming Environmental Quality Act which relate to their divisions, and variances therefrom;

- W.S. §41-3-909(a)(iv) enables the *SEO* to enter into cooperative ground-water investigations as may be deemed necessary under the SMP; and

- W.S. §21-17-113(a) enables the trustees of the *University of Wyoming* to enter into agreements with other institutions, universities, colleges, community colleges, boards of trustees of school districts, agencies, associations or corporations, within or without the state, providing for the offering of courses or programs of instruction, in whole or in part, at, or in cooperation with, such other institutions or agencies, or for the delivery of instruction, performance of services, or provision of materials or facilities.

Food Security Act

As lead agency in development of the SMP, the WDA will work with the U.S. Department of Agriculture/Natural Resources Conservation Service (NRCS) office to insure implementation of the SMP is conducted in a manner consistent with the state's Conservation Compliance Plans developed under the Food Security Act. The NRCS is a member of the GPSC and is actively involved in the development and implementation of the SMP. Coordination between the WDA and the NRCS will be ongoing throughout development and implementation of the SMP to insure management measures do not conflict with one another.

Results from special integrated crop management projects, designed to protect ground water from agricultural chemicals, will be incorporated into the pesticide-specific SMP when available. Water quality-oriented BMPs will also be incorporated into the pesticide-specific SMP.

Official Concurrence

Official concurrence from the directors (or representatives) of state agencies, local entities, and appropriate federal agencies with responsibilities under the SMP, stating their agreement with the SMP is provided in Appendix D.

LEGAL AUTHORITY

Introduction

The foundation of Wyoming's ability to carry out prevention and response actions for pesticides in ground water is dependent on its authority to regulate pesticide use and protect ground water. Thus, regulatory authorities must be sufficient to accomplish the desired outcome of the *Wyoming Generic State Management Plan for Pesticides and Ground Water* (SMP).

The general legal authorities that will be used to implement the SMP are described in this component, together with relevant state and/or federal laws and regulations. Wyoming has the necessary legal authorities to effectively implement the SMP.

The Wyoming Attorney General's office has reviewed this component and concurred each state agency has the statutory authority cited (Appendix D).

State Legal Authorities

Wyoming Department of Agriculture

The WDA will use the powers granted by FIFRA and Wyoming's Environmental Pesticide Control Act of 1973 to implement the SMP.

Wyoming Environmental Pesticide Control Act

The Wyoming legislature determined that although pesticides and pest control devices are valuable to Wyoming's agricultural production and to the protection of man and the environment from insects, rodents, weeds, and other forms of life which may be pests, it is essential to the public health and welfare that they be regulated closely to prevent adverse effects on human life and the environment.

The purpose of the Wyoming Environmental Pesticide Control Act of 1973 (Wyoming Statute (W.S.) §35-7-350 to §35-7-374) is to regulate the labeling, distribution, storage, transportation, disposal, use and application of pesticides used to control pests. The dissemination of accurate scientific information as to the proper use or non-use, of any pesticide, is vital to the public health and welfare, and the environment, both immediate and future. Therefore, it is deemed necessary to provide for registration of pesticides and devices.

The Wyoming Environmental Pesticide Control Act is administered by the WDA. The Wyoming Environmental Pesticide Control Act allows the Pesticide Board of Certification[1] to implement the following prevention actions:

- Promulgate emergency rules through the authorities of the Wyoming Administrative Procedures Act (W.S. §16-3-103(b));

- Promulgate regulations relating to the time, place, manner, methods, materials, amounts, and concentrations in connection with the application of pesticides (W.S. §35-7-355);

- Require pesticides and devices to be registered with the WDA (W.S. §35-7-356);

- Allow the Director of the WDA to issue experimental use permits for pesticides (W.S. §35-7-357);

- Allow the Director of the WDA to refuse to register a pesticide, cancel or suspend registration of a pesticide (W.S. §35-7-358);

- Require licensing of commercial and private pesticide applicators through the Wyoming Environmental Pesticide Control Act (W.S. §35-7-359); and

- Register aircraft, used for applying pesticides, with the WDA on an annual basis (W.S. §35-7-373).

The Wyoming Environmental Pesticide Control Act also allows the WDA, through the Director, to;

- Inspect equipment used for applying pesticides and require repairs or other changes before its further use for pesticide application (W.S. §35-7-361); and

- Cooperate with and enter into any agreements with any other agency of the state, the U.S., and any other state or agency thereof for the purpose of carrying out the provisions of the Wyoming Environmental Pesticide Control Act and securing uniformity of regulation (W.S. §35-7-368).

The Wyoming Environmental Pesticide Control Act prohibits:

1 The Pesticide Board of Certification comprises the director of the Wyoming Department of Agriculture, one member of the Wyoming Weed and Pest Council, and a University of Wyoming weed or pest specialist to be appointed by the governor (Wyoming Environmental Pesticide Control Act of 1973 §35-7-353).

- The discard, transport, or storage of any pesticide or pesticide container in a manner injurious to humans, vegetation, crops, livestock, wildlife, beneficial insects; or the pollution of any waterway that is harmful to any wildlife therein (W.S. §35-7-364); and

- Any person to 1) detach, alter, deface, or destroy any labeling prior to proper disposal of the pesticide containers, 2) refuse to keep any records as required by the Director of the WDA by regulation, or to refuse to allow the inspection of such records by the Director during normal working hours, 3) make available for use, or to use, any restricted pesticide classified for restricted use for some or all purposes, except by or under the direct supervision of a certified applicator, 4) use any registered pesticide in a manner inconsistent with its labeling which means to use any registered pesticide in a manner not permitted by the labeling, or not authorized by the Director under a special local need registration, an experimental use permit or an emergency exemption, 5) to falsify any records required by the Director by regulation, 6) to falsify any application, examination or affidavit for certification or license, 7) use restricted-use pesticides unless they are certified applicators, or working under the direct supervision of a certified applicator, and 8) use restricted-use pesticides inconsistent with the applicator category of certification (W.S. §35-7-374).

In response to pesticide contamination, the Wyoming Environmental Pesticide Control Act:

- Holds pesticide users liable for any damage to the person or lands of another caused by the use of pesticides, even though pesticide use conforms to the rules and regulations of the Wyoming Environmental Pesticide Control Act (W.S. §35-7-360); and

- Allows promulgation of regulations which may restrict or prohibit use of pesticides in designated areas during specified periods of time (W.S. §35-7-355).

Chapter 28, Applicator Certification Rules and Regulations

The Wyoming Environmental Pesticide Control Act provides the legal authority for the WDA to implement the SMP. Chapter 28 of the WDA's rules and regulations, "Applicator Certification Rules and Regulations", helps insure prevention of ground-water contamination by pesticides through education and regulation of pesticide applicators and dealers.

Chapter 28 requires certification of both commercial and private applicators, and provides standards for certification of 1) commercial applicators (Section 5, "Standards for Certification of Commercial Applicators"), and 2) private applicators (Section 9, "Standards for Certification of Private Applicators"). Chapter 28 also provides standards for supervision of non-certified applicators by certified private and commercial applicators (Section 7, "Standards for Supervision of Non-Certified Applicators by Certified Private and Commercial Applicators").

Certified commercial applicators and dealers are required to maintain and retain accurate and legible records of restricted-use pesticide sales and uses for a period of at least 2 years (Section 13, "Reports and Records").

Section 14, "Required Practices for Commercial and Private Applicators" requires:

- certified commercial and private applicators to notify the WDA of any change of business address within 7 days; and

- certified commercial applicators making a commercial application to inform the customer of 1) pesticides applied, 2) possible residue hazards, 3) any restricted entry periods, 4) any waiting periods prior to harvest, 5) application date(s) and time(s), 6) post-application label safety precautions, and 7) other applicable label requirements (e.g., posting, Worker Protection Standards, etc.) prior to application.

Chapter 28 requires pesticide dealers to be licensed. The license must be renewed annually (Section 12, "Licensed Pesticide Dealer").

When it is determined that standards for the certification of private or commercial applicators must be more stringent than the standards in Section 5 or Section 9, and, additional special identification is necessary for an individual using a highly toxic pesticide or applying a pesticide which has been demonstrated to be particularly hazardous to the environment, the standards for the applicator shall include, in addition to the applicator's category standards, an especially high degree of knowledge concerning the compound's action, its' limitations and the areas in which it is to be applied (Section 11, "Pesticides Subject to Other Restrictions as Provided by the Board of Certification").

Wyoming Department of Environmental Quality/Water Quality Division

The Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD) has authority under the Wyoming Environmental Quality Act, and rules and regulations promulgated thereunder, to implement responsibilities under the SMP.

Wyoming Environmental Quality Act

The purpose of the Wyoming Environmental Quality Act is to enable the State of Wyoming to:

- Prevent, reduce, and eliminate pollution;

- Preserve and exercise the primary responsibilities and rights of the State of Wyoming;

- Retain for the state the control over its air, land and water; and

- Secure cooperation between agencies of the state, agencies of other states, interstate agencies, and the federal government in carrying out these objectives (W.S. §35-11-102).

The WDEQ/WQD will use the legal authority provided by the Wyoming Environmental Quality Act to implement responsibilities under the SMP and protect ground water.

Legal authority to cooperate and participate in implementing responsibilities of the SMP are provided by the following sections of the Act:

- W.S. §35-11-102 provides for cooperation between agencies of the state, agencies of other states, interstate agencies, and the federal government in carrying out the objectives of the Wyoming Environmental Quality Act;

- W.S. §35-11-102 allows WDEQ/WQD to participate in the development and implementation of ground-water monitoring programs for pesticides and in responding to detections of pesticides in ground water;

- W.S. §35-11-109(a)(iv) provides authority to conduct, encourage, request and participate in studies, surveys, investigations, research, experiments, training and demonstration by contract, grant or otherwise;

- W.S. §35-11-109(a)(v) requires the WDEQ/WQD to conduct programs of continuing surveillance, and regular periodic inspections of all actual or potential sources of pollution;

- W.S. §35-11-110(a)(iv) provides the Administrator of the WDEQ/WQD with the authority to determine the degree of water pollution throughout the state and parts thereof.

The Wyoming Environmental Quality Act provides the WDEQ/WQD with the necessary authority to protect ground water through the prevention, reduction, and elimination of pollution that could affect waters of the state.

W.S. §35-11-301 of the Wyoming Environmental Quality Act provides the WDEQ/WQD the authority to prevent ground-water contamination by requiring permits:

> (a) No person, except when authorized by a permit issued pursuant to the provisions of the Wyoming Environmental Quality Act, shall:
>
> > (i) Cause, threaten or allow the discharge of any pollution or wastes into the waters of the state; or

(ii) Alter the physical, chemical, radiological, biological or bacteriological properties of any waters of the state.

Any permit issued by the Department must protect surface and ground water as required by W.S. §35-11-301(a)(i) and (ii), and the standards and regulations adopted pursuant to the Wyoming Environmental Quality Act.

W.S. §35-11-302 provides the Administrator of the WDEQ/WQD with the authority to recommend standards, rules, regulations or permits. The Administrator, after receiving public comment and after consultation with the advisory board, shall recommend to the Director rules, regulations, standards, and permit systems to promote the purposes of the Wyoming Environmental Quality Act.

The Wyoming Environmental Quality Act provides the WDEQ/WQD with the necessary framework to carry out response actions if ground-water contamination by pesticides is detected:

- W.S. §35-11-110(a)(iv) provides the Administrator with the authority to determine the degree of water pollution throughout the state and parts thereof;

- W.S. §35-11-109(a)(vii) provides authority to investigate and resolve violations of the Wyoming Environmental Quality Act or any rules and regulations adopted thereunder;

- W.S. §35-11-109(a)(vi) provides the authority to designate representatives of the WDEQ/WQD to enter and inspect any property except private property on or at which a water pollution source is located or is being constructed or installed; and

- W.S. §35-11-110(a)(vii) provides the authority to require monitoring of point sources.

Wyoming Water Quality Rules and Regulations

The Wyoming Water Quality Rules and Regulations provide the WDEQ/WQD with the following legal authority to protect surface water and ground water of the state:

- Chapter I, "Quality Standards for Wyoming Surface Waters";

- Chapter II, "Discharges/Permit Regulations";

- Chapter III, "Regulations for Permit to Construct, Install or Modify Public Water Supplies, Wastewater Facilities and other Facilities Capable of Causing or Contributing to Pollution";

- Chapter IV, "Regulations for Releases of Oil and Hazardous Substances into Waters of the State of Wyoming";

- Chapter VIII, "Quality Standards for Wyoming Ground Waters";

- Chapter IX, "Wyoming Ground-water Pollution Control Permit";

- Chapter XI, "Design and Construction Standards for Sewerage Systems, Treatment Works, Disposal Systems or other Facilities Capable of Causing or Contributing to Pollution and Mobile Home Park and Campground Sewerage and Public Water Supply Distribution Systems";

- Chapter XII, "Design and Construction Standards for Public Water Supplies";

- Chapter XIII, "Class I Hazardous Waste and Nonhazardous Waste Wells Underground Injection Program"; and

- Chapter XVIII, "General NPDES Permits".

National Pollutant Discharge Elimination System Program

Each facility that discharges effluent to the nation's waterways is required to obtain a permit specifying the amount of pollutants which may be released. While the primary purpose of the National Pollutant Discharge Elimination System (NPDES) is to protect surface water quality, reduction in pollutant loading to surface water may also reduce the risk of ground-water contamination where surface and ground waters interconnect. Pesticide manufacturing and formulating facilities, as well as industrial users of pesticides, are subject to the NPDES permit requirements (EPA, 1992a).

In Wyoming, the EPA's NPDES program has been delegated to the WDEQ/WQD. The WDEQ/WQD administers the NPDES program through the legal authority provided by W.S. §35-11-301(a)(i)(ii), Chapters I, II, and XVIII. Under the NPDES program, any discharge of process or produced water to surface water must have a NPDES permit. The permit contains requirements for the quality and/or quantity of the effluent and establishes monitoring and sampling requirements to protect the surface waters of the State of Wyoming.

The WDEQ/WQD is also responsible for enforcing regulations commonly called "storm water regulations". The intent of the storm water regulations is to reduce, eliminate, or minimize contamination of storm water runoff from industrial activities by requiring facilities to obtain permits for storm water discharges. The WDEQ/WQD uses a general permit to cover such facilities. Under the general permit, the company applies for coverage using an application called a "Notice of Intent" (NOI). The WDEQ/WQD reviews the NOI, and if the NOI is approved, will grant the company coverage under the permit.

Point Source Permitting

The Wyoming Environmental Quality Act requires any facility, capable of causing or contributing to pollution, to obtain a permit to construct or operate from the WDEQ/WQD prior to actual construction or operation. This prevention program is directed at point sources of contamination with the authorities contained under W.S. §35-11-301 and Chapter III. Permits issued under Chapter III are required to protect ground- and surface water quality and uses, or a construction and/or operation permit cannot be issued.

Any permit to construct which is issued by the WDEQ/WQD must protect surface and ground water as required by W.S. §35-11-301(a)(i) and (ii). Surface water standards are contained in Chapter I. Wyoming Ground-water Quality Standards are contained in Chapter VIII. Disposal of wastes by injection well are regulated under Chapter IX and Chapter XIII.

Chapter III requires that the owner of any well which qualifies under Article 3 of the Wyoming Environmental Quality Act, or any rules or regulations promulgated thereunder, obtain a WDEQ/WQD authorized Permit to Construct prior to the construction or installation of the well. Design, construction and operation standards are contained in Chapter XI.

Chapters III, XI and XII regulate any well used for a public water supply well, (which the Wyoming Environmental Quality Act defines as containing 20 or more service connections); any well or borehole installed to conduct studies to gather the necessary information needed to make application for any permit required under the Wyoming Environmental Quality Act; and any well installed for the purpose of controlling ground-water contamination, subsurface disposal, or storage of wastes. The WDEQ also regulates wells used in WDEQ - required investigations and monitoring to define the subsurface environment necessary to accomplish definition of the concentrations and extent of contamination, to conduct compliance monitoring, and to conduct corrective action and/or monitoring of any corrective action required by the Wyoming Environmental Quality Act.

Oil and Hazardous Material Spill Program

The WDEQ/WQD has an Oil and Hazardous Material Spill program that requires reporting, containment, cleanup and disposal of any oil or hazardous materials (including pesticides) which are spilled. The regulations relating to spills are contained in Chapter IV. In cases of extreme hazards to a public water supply or a drinking water supply where the responsible party of a spill will not provide an alternate supply, the Governor of Wyoming can be approached for potential use of Emergency Funds.

Wyoming Ground-water Quality Standards

In Wyoming, federally established maximum contaminant levels (MCLs) are normally used as Wyoming Ground-water Quality Standards (Appendix C, Table C-1; Appendix H). When an MCL is not available, the Administrator of the WDEQ/WQD establishes ground-water quality

standards which will not impair the water for its use suitability or which may contribute to a condition in contravention of ground-water quality standards or to any toxic or hazardous effect to natural biota. These ground-water quality standards can be either health advisory levels (HALs) or the latest available scientific information. The latest available scientific information is also used to establish ground-water quality standards for other uses (i.e. agriculture, livestock, fish, aquatic life, etc.).

Wyoming's Ground-water Quality Standards are contained in Chapter VIII. Wyoming's Ground-Water Quality Standards are use protection standards, not drinking water standards. The ground-water quality standards protect ground-water use and potential use for which it is suitable.

Nonpoint Source Program

Wyoming is currently developing a nonpoint source management plan to protect surface water and ground water from all types of nonpoint source pollution. Nonpoint pollutant sources include agriculture and silviculture; pesticides used in these activities may contaminate both surface water and ground water. When completed, portions of the SMP relevant to nonpoint source pollution, will be adopted by the Nonpoint Source Task Force and incorporated into Wyoming's Nonpoint Source Management Plan.

The legal authority necessary for resolution of nonpoint sources of water quality pollution is contained in W.S. §35-11-301(a)(i) and (ii), which state that a permit is required to discharge to, or alter any properties of, any waters of the state.

Wellhead Protection Program

Congress authorized Wellhead Protection Programs under the SDWA in 1986. Wellhead Protection Programs were established to protect public drinking water supplies from contamination. Wellhead Protection Programs include assessment of hydrologic data and sources of contamination.

State Wellhead Protection Program efforts are directed toward providing educational support and technical assistance to local governments and organizations to delineate wellhead protection areas (WHPAs) on the basis of hydrogeologic data and other information; identifying the sources of potential and existing ground-water contamination in these areas; implementing management approaches to control sources of contamination; and developing a contingency plan for an alternative water supply in the event a public drinking-water supply well becomes contaminated.

The authorities for this program are contained within the Wyoming Environmental Quality Act.

Wyoming State Engineer's Office

The Wyoming State Engineer's Office (SEO) will use the authority provided by the Wyoming Constitution, state statutes, and the specific guidelines and standards of the SEO's Regulations and Instructions, to implement the SMP.

The Wyoming Constitution

The Wyoming Constitution declares all waters within the boundaries of the state to be property of the state (Article 8, §1) and grants general supervision of those waters to the State Engineer (Article 8, §5).

Wyoming Water Law Provisions and SEO Regulations and Instructions

The SEO, and the Board of Control, are responsible for administration of water rights within the state. The Ground-water Division of the SEO is specifically required to issue, record, and maintain permits which grant the right to appropriate and beneficially use ground water pursuant to Part II of its regulations.

The SEO has the legal authority to implement the SMP through the following prevention actions:

- The SEO is provided authority under W.S. §41-3-909(a)(vi) to establish standards for the construction of wells. Part III of the SEO regulations contains the Water Well Minimum Construction Standards; and

- Part III also contains guidelines for proper well abandonment or destruction. "Removed from service" wells are required to be capped to prevent entry or plugged to prevent the well from being a vertical conduit for the transmission of contaminants.

The SEO can respond to contamination of ground water by pesticides through the following legal authorities:

- The SEO has authority granted under W.S. §41-3-909(a)(iv) to make such investigations as may be necessary or desirable, and to cooperate with agencies of the U.S., Wyoming, other states, political subdivisions of Wyoming, any public or private corporation, or any association or individual. However, this authority is directed more at determining the occurrence, quantity, and use of ground-water resources rather than quality;

- The SEO, under W.S. §41-3-909(a)(viii), can require the abatement of any condition, or the sealing of any well, responsible for the admission of polluting

materials into an underground water supply. There is no specific authority to allow the SEO to require restoration of any damage caused by the polluting material; and

- Under W.S. §41-3-909(a)(x), the State Engineer is empowered to take measures necessary to prohibit the construction of illegal wells. Further, the State Engineer is authorized to enforce any provision set forth by the Underground Water Act and may intervene in any process deemed contrary to the policy of the state to conserve and protect its underground water resources. The SEO would, under the implicit jurisdiction given the SEO, investigate for improperly constructed wells where a situation would warrant that action.

Federal Legal Authorities

Federal Insecticide, Fungicide and Rodenticide Act

FIFRA, as amended, gives the U.S. Environmental Protection Agency (EPA) legal authority to regulate pesticides. Before a pesticide can be marketed in the U.S., it must be granted registration. The registration decision is based on a determination that there are no unreasonable adverse effects for humans and the environment, within the constraints of approved uses. All pesticides must be labeled, and the label must specify approved uses and restrictions. The EPA is authorized to suspend, cancel, or restrict the use of a pesticide if it is found, at any time, to pose unreasonable adverse effects or imminent hazards to the environment.

Pesticides can be classified for "restricted use" or "general use" based on physical characteristics or on an actual detection in ground water. To be eligible to apply a restricted pesticide, the user must complete a special training program and become a licensed applicator. It is a violation of FIFRA to use a pesticide in a manner that is inconsistent with the label instructions.

The EPA may regulate the design, construction, and location of sites at which pesticides are stored or where mixing and sprayer loading of pesticides will occur. The EPA also regulates the design of irrigation systems used for the application of pesticides, and determines which pesticides will require SMP's as the basis for continuing a pesticide's registration in designated states (EPA, 1990).

Each state is responsible for providing training programs to certify pesticide applicators in accordance with Section 11 of FIFRA.

The Wyoming Department of Agriculture (WDA) has pesticide-user certification primacy under FIFRA. The WDA does not have enforcement primacy under FIFRA, but does have enforcement primacy under the Wyoming Environmental Pesticide Control Act. The WDA has entered into a cooperative agreement with the EPA to delineate duties and responsibilities covering potential gaps and/or duplicate efforts in administration of the pesticide enforcement program. The

WDA refers pesticide violation cases or problems to the EPA if the severity of the non-compliance is warranted.

Safe Drinking Water Act

The federal Safe Drinking Water Act (SDWA) establishes safe drinking water standards, regulates underground injection practices, and establishes a ground-water control program.

The SDWA, enacted on December 16, 1974, and codified as 42 U.S.C. 300(f) et seq., is the basis for protecting public drinking water systems from harmful contaminants. The major part of this law is title XIV of the Public Health Service Act - Safety of Public Water Systems. Basically, the Public Health Service Act directs the EPA Administrator to develop:

- National primary drinking water regulations that incorporate MCLs or treatment techniques;

- Underground injection control regulations to protect underground sources of drinking water; and

- Ground-water protection grant programs for the administration of sole-source aquifer demonstration projects and for wellhead protection area programs.

The Public Health Service Act permits these activities to be implemented by the states (Congressional Research Service, 1991). However, the state of Wyoming does not have primacy for the Public Water System Supervision (PWSS) program and EPA - Region 8 implements the program. Under the PWSS program:

- Public Water Systems (PWS) are periodically required to monitor for 33 pesticides;

- Monitoring frequency is increased if a pesticide is detected;

- The SDWA allows a monitoring waiver program to be developed that allows PWSs to forego monitoring if a vulnerability assessment is performed on the source water;

- Public notification to consumers is required if a pesticide MCL is exceeded or it is not monitored as required;

- EPA has administrative enforcement and civil penalty authority for violation of any National Primary Drinking Water regulation; and

- EPA has emergency enforcement authority upon learning that "...a contaminant which is present in or is likely to enter a public water system or an underground source of drinking water may present an imminent and substantial endangerment to the health of persons..." (Schmidt, 1996).

Gaps in Existing Authorities

Wyoming has the necessary legal authorities to effectively implement the SMP.

RESOURCES

Introduction

The ability to carry out the commitments described in the *Wyoming Generic State Management Plan for Pesticides and Ground Water* (SMP) depends on the resources available to implement the program. Resources include physical and operational capabilities, personnel and technical expertise, and funding.

Wyoming is committed to protecting ground water from pesticide contamination and has provided the personnel, equipment, and research necessary to fulfill its responsibilities under the SMP. The basic resources necessary for the development and implementation of the SMP are currently available and are being utilized by the cooperating state agencies. To-date, no serious gaps exist which could adversely affect the overall SMP program.

Wyoming Department of Agriculture

Physical and Operational Capabilities

The U.S. Environmental Protection Agency's (EPA's) "Pesticides and Ground-water Strategy" requires the Wyoming Department of Agriculture (WDA) to develop an SMP to allow continued use of pesticides that might otherwise be unavailable due to cancellation of the federal registration over ground-water contamination concerns. The Wyoming Environmental Pesticide Control Act provides the legal authority for the WDA to implement the SMP.

Several in-house resources provide the WDA with the physical capabilities necessary to develop and implement the SMP program. These include, but are not limited to:

- Technical staff to co-chair the Ground-water and Pesticides Strategy Committee (GPSC);
- Technical staff to work with federal, state, and local entities in the development and implementation of the SMP;
- A fleet of vehicles; and
- Personal computers.

Personnel and Technical Expertise

The WDA staff has extensive knowledge in state and federal pesticide laws, regulations, procedures, and policies relating to pesticide registration, enforcement, and applicator certification and training. The staff also has training and technical expertise in areas of agriculture, agronomy, biology, chemistry, entomology, range management, soil science, and weed science.

Funding

Current and continuing efforts by the WDA to develop the SMP have been contingent upon General Fund appropriations from the Wyoming Legislature. Development of the SMP is also supported by annual grants provided by the EPA Pesticide Enforcement Program.

The WDA has received general fund appropriation(s) from the Wyoming Legislature to fund baseline ground-water monitoring programs. These funds are provided in part by pesticide and fertilizer registration fees. The U.S. Geological Survey (USGS) has provided matching funds for baseline ground-water monitoring activities.

The state of Wyoming anticipates the EPA will provide funding assistance to carry out the SMP programs. Both the WDA and the Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD) are currently involved in cooperative agreements with the EPA under various federal statutes such as the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Clean Water Act, respectively, and will make future applications for funding assistance to help offset the costs of developing and implementing the SMP program.

Wyoming Department of Environmental Quality/Water Quality Division

Physical and Operational Capabilities

As a cooperative state agency, the WDEQ/WQD is committed to the development of the SMP. The Wyoming Environmental Quality Act provides the legal authority for the WDEQ/WQD to implement portions of the SMP.

Several in-house resources provide the WDEQ/WQD with the physical capabilities necessary to develop and implement the SMP program. These include, but are not limited to:

- Technical staff to co-chair the GPSC;
- Technical staff to work with federal, state, and local entities in the development and implementation of the SMP;
- A fleet of vehicles,
- Personal computers, and
- A water quality laboratory.

Personnel and Technical Expertise

The WDEQ staff has extensive knowledge in state and federal surface and ground-water protection regulations and policies. The staff has training and technical expertise in areas of hydrogeology, geology, environmental engineering, civil engineering, chemistry, biology, range management, management and planning. The WDEQ/WQD also has access to a variety of technical expertise in the Air Quality, Land Quality, and Solid and Hazardous Waste Divisions of WDEQ.

Funding

Current and continuing efforts by the WDEQ/WQD to develop the SMP have been in part, contingent upon General Fund appropriations from the Wyoming Legislature. Development and implementation is supported primarily by federal operating grants such as Clean Water Act 106 and 319 funds provided by the EPA. These funds are a principal source of funding for ground-water monitoring activities by the WDEQ's Nonpoint Source (NPS) program.

Wyoming State Engineer's Office

Physical and Operational Capabilities

As a cooperative state agency, the Wyoming State Engineer's Office (SEO) is committed to development of the SMP.

Several in-house resources provide the SEO with the physical capabilities necessary to develop and implement the SMP program. These include, but are not limited to:

- Technical staff to co-chair the GPSC;
- Technical staff to work with federal, state, and local entities in the development and implementation of the SMP;
- A database for all permitted water wells within the state of Wyoming;
- Field offices from which to disseminate information;
- A fleet of vehicles; and
- Personal computers.

Personnel and Technical Expertise

The SEO staff comprises primarily civil engineers and geologists.

Funding

The SEO is funded through the Wyoming Water Development Commission. Funding is provided as a portion of the mineral severance tax revenue collected by the state of Wyoming.

University of Wyoming Cooperative Extension Service

Physical and Operational Capabilities

As a cooperative state agency, the University of Wyoming - Cooperative Extension Service (UW - CES) is committed to the development of the SMP.

Several in-house resources provide the UW - CES with the physical capabilities necessary to develop and implement the SMP program. These include, but are not limited to:

- Technical staff to participate on the GPSC;
- Technical staff to work with federal, state, and local entities in the development and implementation of the SMP;
- Pesticide applicator training programs;
- A fleet of vehicles;
- Personal computers;
- Expertise on pesticide management; and
- Expertise on pesticide application and ground-water pollution prevention.

Personnel and Technical Expertise

The UW - CES staff has extensive knowledge in state and federal pesticide laws, regulations, procedures, and policies relating to pesticide registration, enforcement, and applicator certification and training. The staff also has training and technical expertise in areas of entomology, weed science, and geology. Additionally, the UW - CES has access to the multiple disciplines within the many departments of the University of Wyoming (i.e. hydrogeology, geology, agricultural engineering, etc.).

Funding

The UW - CES operates under federal funding provided by the United States Department of Agriculture (USDA).

Spatial Data and Visualization Center

Physical and Operational Capabilities

The Wyoming Water Resources Center (WWRC) was established in 1982 to operate in a firm partnership with state agencies charged with major responsibilities for water resources management in the state. The WWRC, in cooperation with the EPA, WDA, and WDEQ, began developing aquifer sensitivity maps (identifying aquifers sensitive to contamination) for Wyoming on a county-by-county basis using the Geographic Information System (GIS) and a modified DRASTIC methodology. GIS/DRASTIC input for each county included data on depth to ground water, recharge, geohydrology, soils, slope, vadose zone, aquifer conductivity, irrigated/nonirrigated agricultural land, public land survey, transportation, hydrography, sensitivity, and vulnerability. The aquifer sensitivity maps, combined with land use data and pesticide use data, are then used to generate ground-water vulnerability maps (identifying areas where ground water is vulnerable to contamination from pesticides).

Subsequent to the 1998 closure of the WWRC, the Spatial Data Visualization Center (SDVC) assumed responsibility for the aquifer sensitivity mapping project. As of June 1999, aquifer sensitivity and ground-water vulnerability maps for each of Wyoming's twenty three counties were completed.

Several in-house resources provide the SDVC with the physical capabilities necessary to develop and implement the SMP program. These include, but are not limited to:

- Technical staff to develop aquifer sensitivity and ground-water vulnerability mapping for use in the SMP;
- Technical staff to work with federal, state, and local entities in the development and implementation of the SMP;
- A fleet of vehicles;
- Personal computers; and
- GIS workstations.

Personnel and Technical Expertise

The SDVC staff has training and technical expertise in areas of GIS, soil science, and geohydrology. Additionally, the SDVC has access to the multiple disciplines within the many departments of the University of Wyoming.

Funding

In general, the WWRC was funded through the Wyoming State Legislature. The SDVC is funded by federal research grants. The "Wyoming Statewide Ground-water Vulnerability Mapping Project" was funded through Clean Water Act 319 funds from the EPA.

Other Federal, State, and Local Agencies and Organizations

In addition to the cooperating state agencies, various federal, state and local agencies and organizations either directly or indirectly provided the personnel and technical expertise necessary to develop and implement the SMP. These agencies and organizations are discussed in detail in "Roles and Responsibilities of State Agencies".

General categories of personnel available from participating agencies and organizations included hydrogeologists, agronomists, geologists, soil scientists, resource planners and conservationists, weed scientists, entomologists, pest management specialists, educators, farmers, ranchers, landowners, agricultural engineers, irrigation engineers, chemists, biologists, range management specialists, horticulturalists, plant pathologists, ecologists, and local, state and federal planners.

Development Costs To-date

Costs incurred to-date (6/99) to develop and implement the *Wyoming Generic State Management Plan for Pesticides and Ground Water,* are provided in Appendix E.

The WWRC and SDVC have completed aquifer sensitivity and ground-water vulnerability mapping for each of Wyoming's twenty three counties.

To-date, the USGS has conducted ground-water monitoring activities in eight of twenty three counties, including Goshen, Park, Washakie, Fremont, Lincoln, Laramie, Big Horn, and Sheridan counties. The USGS has summarized the ground-water data in reports, generated fact sheets to promote public education, and provided public meetings in which to discuss each ground-water monitoring program.

Western Water Consultants, Inc., (WWC) under contract with the WDA, provided consulting services in the development of the *Wyoming State Management Plan for Pesticides and Ground Water*.

BASIS FOR ASSESSMENT AND PLANNING

Introduction

The purpose of assessment is to establish priorities and develop a ground-water protection plan based on characterization of the ground-water resource, identification of potential contaminant sources, and programmatic needs.

The effectiveness of protection activities under the *Wyoming Generic State Management Plan for Pesticides and Ground Water* (SMP) depends to a large extent on the degree to which vulnerable areas in need of protection can be accurately identified. This component describes Wyoming's ongoing efforts to provide basic information on the occurrence, movement, and quality of ground water in relation to the occurrence, movement, and quantity of pesticides. In this manner, protection activities can be tailored to Wyoming's unique hydrogeologic settings, pesticide use patterns, and agronomic practices.

Aquifer Sensitivity and Ground-water Vulnerability Assessment

The Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD), the Spatial Data Visualization Center (SDVC) and the U.S. Environmental Protection Agency (EPA) - Region 8, conducted a study of the state's ground-water resources. The study resulted in the development of aquifer sensitivity and ground-water vulnerability maps for each Wyoming's twenty three counties. These maps describe the ground-water sensitivity and vulnerability of hydrogeologic settings, as well as of irrigated and non-irrigated cropland. The state's approach and activities to assess aquifer sensitivity and ground-water vulnerability are described below (Needham, 1993).

Aquifer Sensitivity Method

Aquifer sensitivity is the relative ease with which a contaminant (in this case a pesticide) applied on or near a land surface can migrate to the aquifer of interest. Aquifer sensitivity is a function of the intrinsic characteristics of the geologic materials in question, any overlying saturated materials, and the overlying unsaturated zone. Sensitivity is not dependent on agronomic practices or pesticide characteristics (EPA, 1994a).

The procedure used to create Wyoming's aquifer sensitivity maps is similar to the DRASTIC (see Glossary) method for assessing ground-water pollution potential. The Wyoming aquifer sensitivity mapping procedure differs from DRASTIC in a number of key aspects. First, the Wyoming procedure incorporates different mapping layers. While DRASTIC uses map layers for vadose zone and aquifer materials, the Wyoming procedure incorporates these two layers into a more comprehensive geohydrologic mapping unit. Second, the Wyoming procedure does not adhere to the DRASTIC method for assigning rating values to pre-defined map classes. A new

rating system has been developed that reflects Wyoming's hydrogeologic environment and landscape characteristics influencing contaminant transport. Third, the Wyoming procedure does not apply weights to each of the individual aquifer sensitivity maps. Fourth, ground-water vulnerability in the Wyoming study is accounted for by integrating a rating map of irrigation related recharge with the final aquifer sensitivity map (Needham, 1993).

Wyoming's aquifer sensitivity mapping utilizes key environmental/landscape characteristics that influence the transport of contaminants from the ground surface through soil and geological media into and through an aquifer. These mappable characteristics are:

- Depth to ground water;
- Net annual recharge of precipitation, snow melt, and irrigation;
- Geohydrologic setting of the ground water;
- Soils;
- Land slope; and
- Vadose zone characteristics (Needham, 1993).

Maps were produced for each of the six characteristics utilizing the SDVC's Geographic Information Systems (GIS). Ratings were then assigned to each of the characteristic maps, showing the relative ability of the mapped area to influence movement of contaminants to the underlying ground water.

The final aquifer sensitivity map was created by combining the six individual rating maps and summing the rating values. The ratings of the final aquifer sensitivity map reflect the contribution of each individual map layer. The aquifer sensitivity map reflects an aquifer's inherent potential to become contaminated. A high sensitivity score indicates the capacity of the hydrogeologic environment and the landscape factors to readily move water-borne contaminants into the ground water. Low ratings represent ground water that is better protected from contaminant leaching by the natural environment (Needham, 1993). Ratings are relative and not quantitative.

Aquifer sensitivity assessments were conducted at the county level. However, county-level assessments are based more on hydrogeologic settings rather than county lines. For example, aquifer sensitivity in Goshen County was assessed on the alluvial aquifer associated with the North Platte River; county lines did not limit the assessment.

Ground-water Vulnerability Method

Ground-water vulnerability is the relative ease with which a contaminant (in this case a pesticide) applied on or near a land surface can migrate to the aquifer of interest under a given set of agronomic management practices, pesticide characteristics, and aquifer sensitivity conditions (EPA, 1994a).

The EPA - Region 8, SDVC, WDEQ/WQD, Wyoming Department of Agriculture (WDA), and State Engineer's Office (SEO), cooperatively prioritized Wyoming counties according to ground-water vulnerability to pesticide contamination and data availability. Based on this priority ranking, ground-water vulnerability mapping will be conducted from the highest ranked county to the lowest ranked county, as resources allow. The resulting ground-water vulnerability maps can then be used to design ground-water monitoring programs at the county level. A description of the formula used to rank areas of ground-water vulnerability is provided in Appendix F. A list of Wyoming counties, ranked relative to the pesticide use intensity formula, is also included in Appendix F.

Aquifer sensitivity maps, combined with land use data, and pesticide use data, are used to generate ground-water vulnerability maps which identify areas where ground water is vulnerable to contamination from pesticides. The ground-water vulnerability maps will then be used to prioritize monitoring efforts by ranking ground water based on the degree of vulnerability (Needham, 1993). As described in "Monitoring", ground-water monitoring will begin in the most vulnerable locations, and as resources permit, proceed to areas where ground water is less vulnerable to contamination from pesticides.

Pesticide Use Evaluations

Understanding where and how a pesticide is used is central to the development of an effective SMP. The Ground-water and Pesticides Strategy Committee (GPSC) reviewed county data compiled by the WDA and University of Wyoming - Cooperative Extension Service (UW–CES) on pesticide use data as reported for the 1990 spray season, and identified pesticides which could potentially threaten the quality of Wyoming's ground water. Pesticide identification was based on:

- Relatively large volume use;
- A history of detection in ground water;
- High leaching potential; and
- Use on lands overlying sensitive aquifers.

These pesticides, listed in Appendix G, comprise the primary chemicals to be analyzed in the ground-water monitoring program. The WDA and WDEQ/WQD may also review and evaluate information relative to pesticide use on a site-specific basis prior to selecting the appropriate parameters to be analyzed for each monitored area. The WDA will also review pesticide use records from dealers and commercial applicators of restricted-use pesticides. Based on the results of the records review, the list of pesticides will be revised/updated on a regular basis. The WDA also has the authority to request records of non-restricted use pesticides in specific instances (e.g., if pesticide use generates a complaint from the public, or creates an environmental hazard, or if the pesticide is applied during the course of a "commercial application").

Data Sources

The EPA Ground Water Protection Division's technical assistance document (TAD), entitled. "A Review of Methods for Assessing Aquifer Sensitivity and Ground Water Vulnerability to Pesticide Contamination (EPA, 1993a) which summarizes sensitivity and vulnerability methods, was used by the SDVC and WDEQ/WQD to select an aquifer sensitivity and ground-water vulnerability method.

Reliable sources of data used to assess aquifer sensitivity and ground-water vulnerability include:

Aquifer Sensitivity Mapping:

- *Depth to ground water* data was obtained from the Wyoming State Engineer's Office (SEO) well records;

- *Net annual recharge of precipitation, snow melt, and irrigation* were determined from ground-water recharge area mapping conducted by the U.S. Geological Survey (USGS). Precipitation, snow melt and irrigation data were also obtained from the Wyoming Climatological Atlas, the National Oceanic Atmospheric Administration (NOAA), and the NRCS Snow Survey;

- *Geohydrologic settings of ground water* were determined from detailed hydrologic and geologic maps provided by the USGS;

- Detailed *soil survey maps* on all cropland in Wyoming and agronomic data on which to make priority aquifer sensitivity assessments were provided by the U.S. Department of Agriculture - Natural Resources Conservation Service (NRCS);

- *Land slope* data was provided by the USGS using their digital elevation model (DEM);

- *Vadose zone characteristics* were determined by the Wyoming Geological Survey (WGS); and

- The SDVC's GIS was used to produce maps for each of the six characteristics listed above. *Aquifer sensitivity maps* were then generated which reflect each individual map layer.

Ground-water Vulnerability Mapping:

- The *formula* used to rank vulnerable areas within Wyoming is described in Appendix F. WDEQ/WQD incorporated chemical data generated by the Ground-water and Pesticides Strategy Committee (GPSC) (see Appendix F);

- *Ground-water vulnerability maps* were developed by the SDVC utilizing GIS and incorporating aquifer sensitivity mapping, land use data, and pesticide use data;

- County-level *land use data and crop land data* were provided by the Wyoming Agricultural Statistics Service; and

- *Pesticide use data* and *regional agronomic practices* were provided by the WDA and the University of Wyoming – Cooperative Extension Service (UW – CES). Pesticide use data was compiled in a report entitled, "Pesticide Use in Wyoming – 1990". Local Weed and Pest Districts also provided *pesticide use data.*

Data, studies, and information necessary to assess aquifer sensitivity and ground-water vulnerability will be revised/updated on an as-needed basis.

As described in "Roles and Responsibilities of State Agencies", the EPA, WDA, WDEQ/WQD, UW - CES, SDVC, USGS, NRCS, and local Weed and Pest Districts are committed to the development and implementation of the SMP. These agencies have committed to offering their technical services on an as-needed basis.

Defining Reasonably Expected Uses of Ground Water

Approximately 75 to 80 percent of Wyoming's population relies on ground water as a source of drinking water (Frederick, 1996). Multiple aquifers of varying quality are exploited for ground-water use.

The WDEQ/WQD has promulgated Wyoming Ground-water Quality Standards in Chapter VIII of the WDEQ/WQD Rules and Regulations (1993) which establish aquifer classifications based on current or potentially suitable water uses (Appendix C, Table C-1; Appendix H).

With regard to non-naturally occurring organic chemical compounds such as pesticides, Wyoming ground waters of Class I, II, III, and IV are protected to levels that are considered safe for drinking. This includes ground water that is hydrologically connected to surface water, as well as that which is currently used and can reasonably be expected to be used as a source of drinking water.

Violation of any Wyoming Ground-water Quality Standard will result in an appropriate action by the WDEQ/WQD. Wyoming will consistently apply its definition of ground-water use across all prevention and remediation decisions.

Assessment and Planning

The goal of the SMP is to manage the use of pesticides in order to prevent adverse effects on human health and the environment, and to protect the environmental integrity of Wyoming's ground-water resources. Preventing unacceptable contamination from pesticides rather than relying on remediation is a primary part of that goal.

The effectiveness of protection activities depends to a large extent on the degree to which vulnerable areas in need of protection can be accurately identified. Aquifer sensitivity maps, combined with land use data, and pesticide use data, are used to generate ground-water vulnerability maps which identify areas where ground water is vulnerable to contamination from pesticides.

The ground-water vulnerability maps will then be used to prioritize monitoring efforts by ranking ground water based on the degree of vulnerability (Needham, 1993). As described in "Monitoring", ground-water monitoring will begin in the most vulnerable locations, and as resources permit, proceed to areas where ground water is less vulnerable to contamination from pesticides.

Water quality data collected from the ground-water monitoring programs will be analyzed for quantitative values, not qualitative. Quantitative water quality data will be used to 1) identify areas where pesticide use should be managed to prevent contamination of ground water from pesticides, 2) drive response actions if pesticides are detected in concentrations below or at Wyoming Ground-water Quality Standards, 3) drive regulatory actions when no other alternative exists, if pesticides are detected in concentrations above Wyoming Ground-water Quality Standards, 4) be used to improve planning for protection of ground water from possible pesticide contamination, and 5) be used to monitor the effectiveness of response and/or regulatory actions.

Pesticide detections in one area may trigger a response not only in that area but in other areas of the state with similar hydrogeologic settings, similar sensitivity/vulnerability ratings, and correlative pesticide use. Response actions may be applied on a local, county, or regional basis.

Assessment Limitations

Prevention and response priorities will be based in part on the relative vulnerability of the ground water resource, its use and value. All ground water in Wyoming will receive priority protection to insure the attainment of surface water quality standards. Priorities will be coordinated with the efforts of Wyoming's planned Comprehensive State Ground Water Protection Program (CSGWPP).

The primary limitations to assessment and planning activities for the SMP are resources (e.g., staff availability and funding). Therefore, both the prevention and response programs, as discussed in "Prevention Actions", and "Response to Detections of Pesticides", respectively, are designed to accommodate these limitations on pesticide use and/or land use relative to ground-water vulnerability.

Because all ground water in Wyoming is protected, all ground water should receive equal protection. In practice, however, this may not always be practical or economically feasible. Aquifer sensitivity and ground-water vulnerability maps will be used to identify ground-water resources which are threatened by pesticide contamination and planning efforts will be focused in those areas.

MONITORING

Objective

One of the objectives of the *Wyoming Generic State Management Plan for Pesticides and Ground Water* (SMP) is to design and implement a ground-water monitoring program for pesticides in Wyoming consistent with the ground-water protection goal of the SMP. The protection goal is to "insure present ground-water use can be maintained and that pesticide use will not degrade ground-water quality such that a resource use will be lost".

A ground-water monitoring program, designed and implemented under the SMP, will allow detection of changes in ground-water quality resulting from the use of pesticides. Detection of ground-water contamination will activate a response to protect existing and potential use of the ground-water resource. Non-detect(s) will provide information indicating pesticide use in that area has not or is not creating a problem.

Ground-water monitoring data will be used to 1) determine appropriate response strategies, 2) target the state's resources for future ground-water monitoring, 3) identify areas where present pesticide management plans should be modified to prevent further degradation of ground-water quality, and 4) determine pesticide use has not affected ground-water quality.

Scope

Ground-water monitoring will be approached in a "tiered" manner. Baseline monitoring will be conducted in areas with sensitive aquifers where pesticide use is known to occur (i.e., where ground water is vulnerable to contamination from pesticides (see "Basis for Assessment and Planning"). Whenever possible, existing wells will be used to monitor ground-water quality in shallow aquifers, down gradient from potential sources of pesticide contamination (e.g. chemigated fields, flood-irrigated fields, mixing/loading stations, etc.). If pesticides are detected in ground water, additional "tiers" of monitoring will be implemented on a site-specific basis, conditional upon available resources.

As additional tiers of monitoring are implemented, the ground-water monitoring well networks will be revised to meet the specific requirements of each tier.

Program Design and Justification

In an attempt to effectively utilize existing resources, ground-water monitoring activities will be prioritized to areas where ground water is most vulnerable to pesticide contamination, based on aquifer sensitivity maps, land use maps, and pesticide use data.

Aquifer Sensitivity/Ground-water Vulnerability

Aquifer sensitivity maps, combined with land use data, and pesticide use data, are used to generate ground-water vulnerability maps which identify areas where ground water is vulnerable to contamination from pesticides. The ground-water vulnerability maps will then be used to locate areas in which ground water will be monitored, by ranking ground water based on the degree of vulnerability. Ground-water monitoring will begin in the most vulnerable locations, and as resources allow, proceed to areas where ground water is less vulnerable to contamination from pesticides.

As supported by the "Ground-water Vulnerability Ranking Data" provided in Appendix F, the most vulnerable areas in Wyoming are those characterized by irrigated cropland, high aquifer sensitivity, and detections of pesticides in ground water.

Pesticide Use

The Ground-water and Pesticides Strategy Committee (GPSC) reviewed available pesticide use information and identified pesticides which are potential threats to Wyoming's ground water based on:

- Relatively large volume use;
- A history of detection in ground water;
- High leaching potential; and
- Use on land overlying sensitive aquifers.

These pesticides comprise the "core" of pesticides to be analyzed in the baseline ground-water monitoring program and are listed in Appendix C, Table C-1; Appendix H.

The WDA will conduct a regular review of pesticide use records from dealers and commercial applicators of restricted-use pesticides. Based on the results of the record reviews, the list of pesticides will be updated on a regular basis. The WDA also has the authority to request records of non-restricted use pesticides in specific instances (e.g. if pesticide use generates a complaint from the public, creates an environmental hazard, or is applied during the course of a “commercial application”).

Table 6-1 - USGS Pesticide Schedules and Corresponding Analytes

Schedule 2001	
Alachlor	Malathion
Atrazine,desethyl-	Metolachlor
Atrazine	Metribuzin
Azinphos,methyl-	Molinate
Benfluralin	Napropamide
Butylate	Parathion,ethyl
Carbaryl	Parathion,methyl
Carbofuran	Pebulate
Chlorpyrifos	Pendimethalin
Cyanazine	Permethrin-cis
DCPA	Phorate
DDE,p,p-	Pronamide
Diazinon	Prometon
Diethylaniline	Propachlor
Dimethoate	Propanil
Disulfoton	Propargite
EPTC	Simazine
Ethafluralin	Thiobencarb
Ethoprop	Tebuthiuron
Fonofos	Terbacil
HCH,alpha	Terbufos
HCH,gamma	Triallate
Linuron	Trifluralin

Schedule 2050	
Acifluorfen	Diuron
Aldicarb	Fenuron
Aldicarb sulfoxide	Fluometuron
Aldicarb sulfone	Linuron
Bentazon	MCPA
Bromacil	MCPB
Bromoxynil	Methiocarb
Carbaryl	Methomyl
Carbofuran	Neburon
Carbofuran,3-hydroxy	Norflurazon
Chloramben	Oryzalin
Clopyralid	Oxamyl
2,4-DB	Picloram
2,4-D	Propham
Dacthl,Mono-Acid	Propoxur
Dicamba	Silvex
Dichlobenil	2,4,5-T
Diclhoroprop,(2,4-DP)	Triclopyr
Dinoseb (DNBP)	

Use of Existing Wells

Whenever possible, existing ground-water wells will be used to collect ground-water samples, minimizing monitoring expenses. New monitoring wells will be installed only if there is a critical gap in the well network, or additional wells are required to conduct the appropriate tier of ground-water monitoring. The WDA has the regulatory authority to require monitor well installations when required (see "Response to Detections of Pesticides").

The Wyoming State Engineer's Office (SEO), WDEQ/WQD and WDA will be responsible for review and evaluation of existing well data. These agencies will determine whether existing wells, as constructed, are appropriately located and constructed to allow collection of representative ground-water samples from the uppermost aquifer. All well data is electronically stored at the SEO's office in Cheyenne, Wyoming.

Well data specific to the SMP's ground-water monitoring program will also be maintained at the SDVC office in Laramie.

Location Criteria

The SEO, WDEQ/WQD, and WDA will conduct a data search of all existing wells located in vulnerable areas. The data search will include the well permit number, well ownership, well name, well location, well completion information, lithologic information, and water quality information. Once existing wells have been identified, the SEO, WDEQ/WQD, and WDA will evaluate each well to determine if the well is located and constructed in a manner that will allow inclusion in the baseline monitoring well network.

Additionally, the SEO, WDEQ/WQD, and WDA will evaluate potential migration pathways (e.g., man-made features including ditches, areas where fill material has been placed, buried piping, buildings, etc.) which may influence ground-water flow direction. The SEO, WDEQ/WQD, and WDA will also attempt to determine if the well is used for chemigation or is located near a pesticide mixing/loading or storage area. Well locations will be selected that provide effective ground-water monitoring coverage.

Upon completion of the data review, the SEO, WDEQ/WQD, and WDA will plan implementation of the baseline monitoring program.

Design/Construction Criteria

The principal objective of a ground-water monitoring well is to obtain representative ground-water samples from the target aquifer. Monitoring wells are typically designed to monitor site-specific conditions. For this reason, the construction of existing wells will be evaluated before incorporating a well into the ground-water monitoring well network.

Any new ground-water monitoring wells will be constructed in accordance with existing WDEQ/WQD and SEO regulations, insuring proper design and construction.

Existing Wells

Existing well types which may be appropriate for inclusion in the ground-water monitoring well network include: 1) water supply wells (wells used for domestic, stock-watering, municipal, irrigation and industrial supply), 2) ground-water monitoring wells, and 3) observation wells. Additionally, water samples may be collected from existing springs and seeps.

The appropriateness of a ground-water monitoring well design is dictated primarily by the diameter, depth, screened interval, and accessibility of the well. Compatibility of well construction materials with the subsurface environment and chemical analytes, drilling method selected, and well installation procedures employed, also influence the dimensions and the material composition of a ground-water monitoring well. However, due to limited well data, only the diameter, depth, screened interval and accessibility of an existing well will be evaluated prior to incorporation into the baseline monitoring well network.

- The diameter of an existing well must be large enough to allow the collection of a ground-water sample from the well. The minimal acceptable well diameter is 2 inches;

- The depth of a ground-water monitoring well is normally determined by the hydrogeologic conditions at the site being monitored. In order to be incorporated into the baseline monitoring well network, an existing well must be completed in the first relatively permeable water-bearing zone encountered (the uppermost aquifer), since potential pollution sources are most often at ground surface;

- The surface construction of an existing well must allow access to and collection of ground water. Each well will be visually inspected to insure a proper surface seal. Wells with improper seals will not be included in the ground-water monitoring well network; and

- An existing well must be appropriately screened in the uppermost aquifer to allow collection of ground-water samples from the uppermost aquifer. The depths at which contaminants may be located and at which downgradient wells must be screened are functions of 1) geologic factors influencing potential contaminant pathways of migration to the uppermost aquifer, 2) chemical characteristics of the contaminant controlling its likely movement and distribution in the aquifer, and 3) hydrologic factors likely to have an impact on contaminant movement (and detection).

New Wells

Existing wells may not be properly located or have the proper design characteristics to be included in a monitoring well network. If a gap in the network exists, the ground-water monitoring plan may require the installation of new wells. New wells will be added to the monitoring well network as available resources allow.

New ground-water monitoring wells will be designed, constructed and developed in accordance with the Best Available Technology (BAT). At a minimum, new wells will be designed, constructed and developed in accordance with the standards provided in Chapter XI of the WDEQ/WQD's Rules and Regulations. Additional technical guidance will also be used for well design, construction, and development, including the EPA's:

- Resource Conservation and Recovery Act (RCRA) Ground-water Monitoring: Draft Technical Guidance; and

- Handbook of Suggested Practices for the Design and Installation of Ground-water Monitoring Wells: Guidance for Field-Scale Ground-water Monitoring Studies.

All new ground-water monitoring wells will be permitted with the SEO.

Ground-water Monitoring Protocols

Program Components

As previously discussed, a tiered approach to monitoring ground water for pesticide contamination will be implemented. Initially, baseline monitoring will be conducted in areas of vulnerable ground water where pesticide use is known to occur. If pesticides are detected in ground water, additional monitoring of the next level of vulnerable ground water may be conducted.

The different tiers of ground-water monitoring programs are:

- Baseline monitoring;

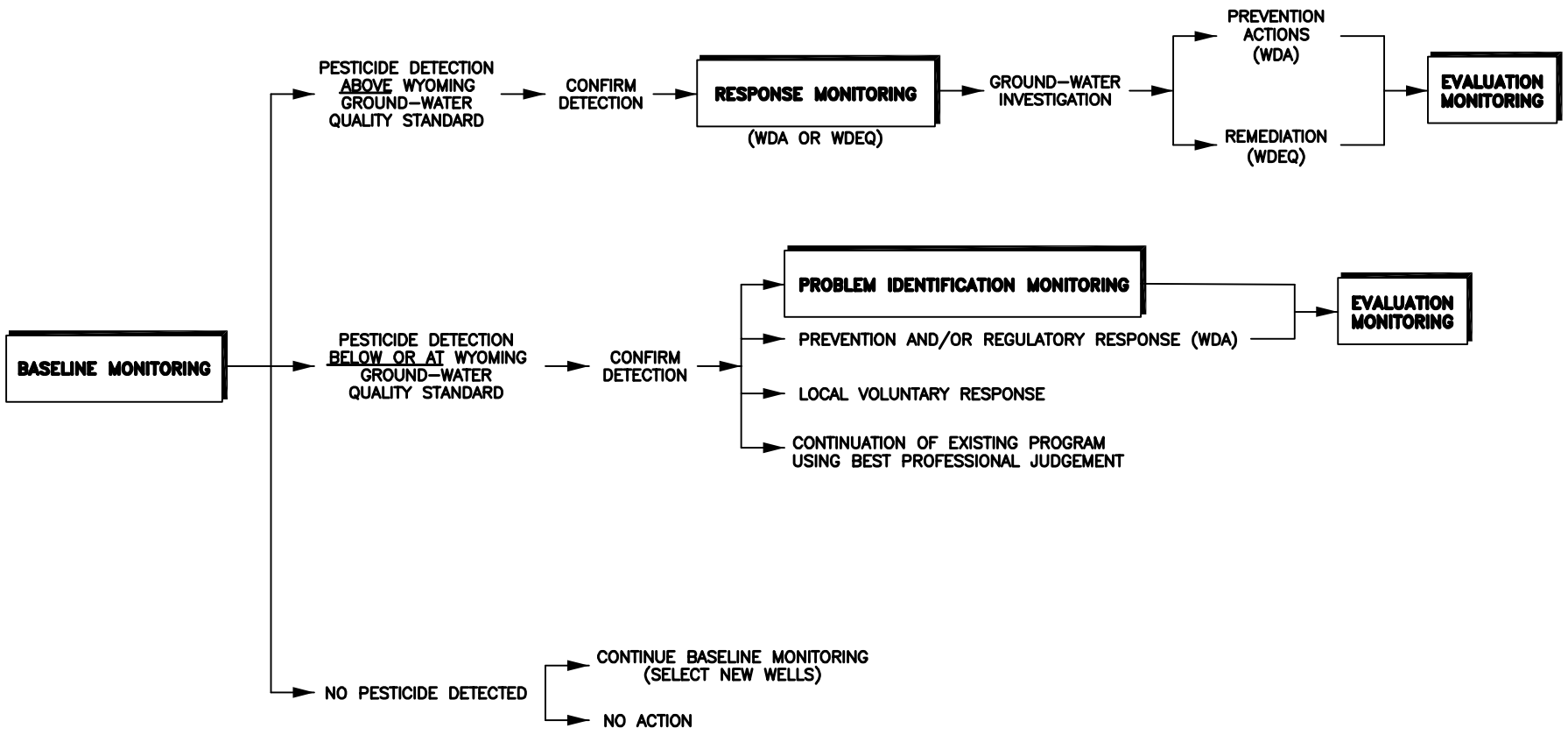
- Problem identification monitoring;

- Response monitoring; and

- Evaluation monitoring.

Figure 6-1 depicts the general criteria that trigger each tier of monitoring and the relationship between each tier.

FIGURE 6-1: WYOMING'S GROUND-WATER MONITORING PROGRAM FOR PESTICIDES



The sampling frequency and chemical parameters to be monitored at each site are based on several factors, including tier of monitoring, land use activity, aquifer sensitivity, and available resources.

Baseline Monitoring

Baseline monitoring will be used to 1) determine baseline ground-water quality conditions, 2) identify ground-water contamination and evaluate potential causes of contamination, and 3) establish trends in water quality, with respect to pesticides, over time.

Before changes in ground-water quality can be detected, existing quality must be determined. The term "baseline" differs from "background" in that it refers to current regional ground-water quality. This may or may not be synonymous with background or pristine ground-water quality that existed before measurable human impact on the aquifer.

It is most cost-effective to target baseline monitoring on the basis of ground-water vulnerability. Initial baseline monitoring will be conducted in areas where the ground water is most vulnerable to pesticide contamination as determined by ground-water vulnerability mapping conducted by the SDVC.

Due to limited resources, baseline monitoring well networks will use existing wells whenever possible. Existing wells must meet the previously described criteria for incorporation into the well network. The number of wells selected as ground-water monitoring wells in each study area will be site- and resource- dependent. Where the WDA and the WDEQ/WQD determine the number of existing wells are not adequate to meet the requirements of a baseline monitoring well network, new wells may be installed, conditional upon available resources. However, for economical reasons, it is desirable to keep the installation of new wells to a minimum.

Baseline ground-water samples will be collected at the direction of the WDA and the WDEQ/WQD. Ideally, ground-water samples will be collected on a semi-annual schedule (e.g. Spring and Fall) to coincide with periods of pesticide application and seasonally high and low ground-water levels). Again, sampling frequency will be dependent upon available resources. Should resources only be adequate for one sampling event, the sampling event will be conducted at a time which will represent "worst case" baseline water quality with respect to the potential presence of pesticides in ground water.

At a minimum, baseline ground-water samples will be analyzed for the following field parameters: static water levels, pH, specific conductivity, and temperature. Samples will also be analyzed for the pesticides of concern (see Appendix C, Table C-1; Appendix H).

No Detection

If no pesticides are detected in a well during baseline monitoring for two consecutive sampling rounds, the WDA will, based on best professional judgement, recommend 1) no action be taken, or 2) different wells completed in the same aquifer in the same county be selected for monitoring (well rotation). Well rotation, as determined by the WDA and the WDEQ/WQD, will allow maximum ground-water monitoring coverage at minimal expense.

Detection Below or At Wyoming Ground-water Quality Standard

If pesticide concentrations are detected below or at Wyoming Ground-water Quality Standards, prompt confirmation sampling may be conducted to confirm the detection ("prompt" being as soon as the analytical data has been received and reviewed and confirmation sampling can be scheduled). If the detection is confirmed, the WDA in consultation with the Technical Review Team will, based on best professional judgement, 1) continue existing programs, 2) allow the affected community to voluntarily respond to the contamination at the local level (e.g., activate the Coordinated Resource Management (CRM) process and voluntarily conduct local problem identification monitoring, establish Pesticide Management Zones (PMZs), etc.), 3) implement pesticide product restrictions and/or prohibition if the local community does not address ground-water contamination to the satisfaction of the WDA, or if pesticide concentrations in ground water appear to be increasing, or 4) initiate problem identification monitoring. Actions based on best professional judgement will allow evaluation of conditions unique to each detection, anomalies, evaluation of whether or not conditions are more severe than a detection in one well indicates, whether or not the pesticide detection is a result of misuse, an illegal discharge or use according to the label, etc.

If pesticides are detected (and verified through subsequent monitoring) in a well during baseline monitoring, the well will continue to be monitored, regardless of the level of detection.

Detection Above Wyoming Ground-water Quality Standard

If pesticides are detected in ground water at concentrations above Wyoming Ground-water Quality Standards, prompt confirmation sampling will be conducted to confirm the detection. If the exceedance is verified and is the result of pesticide misuse or a spill, the WDEQ/WQD will require response monitoring. If the exceedance is verified and is the result of normal pesticide use, the WDEQ/WQD will require response monitoring.

If pesticides are detected (and verified through subsequent monitoring) in a well during baseline monitoring, the well will continue to be monitored, regardless of the level of detection.

Problem Identification Monitoring

Problem identification monitoring can be used to determine 1) to what degree ground water has been contaminated, and 2) the source of contamination. Previously collected baseline

monitoring data will provide a starting point on which the problem identification monitoring program can expand.

Whenever possible, existing wells will be used to conduct problem identification monitoring. At a minimum, problem identification monitoring wells must be located both upgradient and downgradient of potential sources of contamination to identify the source of contamination and define the extent of contamination. Well locations will be selected upon recommendations from the WDEQ/WQD and the SEO.

The sampling frequency and schedule for problem identification monitoring will be largely affected by available resources and local participation and thus must remain flexible. Results of the baseline monitoring program, type, concentration, and application of the detected pesticide, should all be factored into local decisions establishing sample frequency and scheduling. The WDA and the WDEQ/WQD will offer site-specific recommendations.

At a minimum, wells in the problem identification monitoring well network will be monitored for the same pesticides detected during baseline monitoring.

Response Monitoring

Response monitoring will determine the nature, extent, and source of ground-water contamination in an area where pesticides have been detected in concentrations above Wyoming Ground-water Quality Standards.

Detection Above Wyoming Ground-water Quality Standard

If pesticides are detected in ground water during baseline monitoring at concentrations above Wyoming Ground-water Quality Standards, prompt confirmation sampling will be conducted to confirm the detection. If the exceedance is verified and is the result of pesticide misuse or a spill, the WDEQ/WQD will require response monitoring. If the exceedance is verified and is the result of normal pesticide use, the WDA will require response monitoring.

The WDEQ/WQD will require the owner of the affected property, the party responsible for the contamination, or the pesticide registrant to conduct a ground-water investigation of the contaminated area under the authority of Wyoming Statute (W.S.) §35-11-701 of the Wyoming Environmental Quality Act. The ground-water investigation will include:

- Characterization of the hydrogeologic setting of the contaminated area;
- Identification of potential source(s) of contamination;
- Establishment of a ground-water monitoring well network;

- Ground-water monitoring (response monitoring); and

- Delineation of the extent of contamination and source(s) of contamination.

If the owner of the affected property refuses to cooperate with the WDEQ/WQD and conduct a ground-water investigation of the contaminated area, the WDEQ/WQD may undertake its own ground-water investigation and pursue litigation to force compliance. WDA can also take action to discontinue use of the pesticide, if necessary.

Existing wells may not be appropriately located or constructed to be included in a response monitoring well network. If not, the WDEQ/WQD may require the property owner or responsible party to install additional wells. New wells will be located and constructed in accordance with a plan approved by the WDEQ/WQD. The additional wells will allow WDEQ/WQD to determine the extent of the affected area and evaluate the probable cause of contamination.

The sampling frequency and schedule for response monitoring will be established in a site-specific plan to be approved by the WDEQ/WQD. The plan will insure the sampling frequency and schedule allow determination of contaminant concentration trends, and will provide sufficient information for future predictions of contaminant migration from the source area. Sampling will be conducted on a semiannual schedule, at a minimum, to identify temporal changes in ground-water quality.

Based on the results of the ground-water investigation, the WDEQ/WQD and the WDA will determine if remediation of ground-water quality is the most reasonable alternative or if implementation of prevention actions is adequate (e.g. implementation of Best Management Practices (BMPs) or a change in pesticide use). If remediation is not required, the WDA can require the registrant to conduct and/or continue ground-water quality monitoring as a condition of product registration.

If remediation is required, the WDEQ/WQD will require the property owner or responsible party to control and/or remediate the contaminated ground water. If the property owner or responsible party refuses, the WDEQ/WQD can pursue litigation to force compliance. WDA can also discontinue use of the pesticide contaminating ground water, if necessary. Subsequent to remediation, the responsible party will be required to continue monitoring ground-water quality to evaluate the effectiveness of the remedial action.

Evaluation Monitoring

Either the WDA or the WDEQ/WQD will be responsible for requiring evaluation monitoring. If evaluation monitoring is conducted to evaluate the effectiveness of a prevention measure, the WDA will be responsible for implementation of the program. If evaluation monitoring is conducted to evaluate the effectiveness of a remedial action, the WDEQ/WQD will be responsible for requiring the property owner or responsible party to monitor ground-water quality.

Evaluation monitoring serves two purposes; 1) it allows the WDA to evaluate the effectiveness of prevention measures (e.g. mandatory implementation of BMPs, and changes in pesticide use), and 2) it allows the WDEQ/WQD to evaluate the effectiveness of remedial measures on ground-water quality.

Evaluation monitoring wells will be located in a manner that allows evaluation of the effectiveness of prevention measures and/or remedial actions. If evaluation monitoring is required, existing wells used for baseline, problem identification, or response monitoring may not be located and constructed appropriately for use as evaluation monitoring wells. New evaluation monitoring wells will be located and constructed in accordance with a plan approved by the WDA and the WDEQ/WQD.

Since it typically takes several years to document the effectiveness of management practices, continued evaluation monitoring to evaluate impacts of management practices may be conducted. Water quality data will be evaluated relative to the short-term effectiveness of BMPs, PMZs, etc. Long term feedback from evaluation monitoring will be used to adjust management practices, guidelines, and/or management objectives.

To evaluate the effectiveness of a prevention or remedial measure, sampling will be scheduled both before and after implementation and will continue as long as necessary to measure the full effects on ground-water quality. Sampling will be scheduled to cover all temporal variables that could affect the impact of a management measure on ground-water quality.

Data Handling/Storage/Retrieval and Reporting Mechanisms

Both the WDA and the WDEQ/WQD, as co-chairs of the GPSC, will be responsible for 1) reviewing and evaluating ground-water data upon receipt, 2) planning future monitoring activities, and/or 3) requiring changes in pesticide use (WDA) or remedial actions (WDEQ/WQD) to prevent further degradation of Wyoming's ground-water quality.

All ground-water quality data will be permanently stored on the SDVC's STORET database, in Laramie, Wyoming, where it will be available to the public, upon request. Data will also be distributed to the WDA, WDEQ/WQD, SEO, and the EPA.

Additional reporting of ground-water quality results is discussed in "Information Dissemination", and "Records and Reporting".

Data Use

Collected ground-water monitoring data will help characterize and identify water quality trends of Wyoming's sensitive aquifers and vulnerable ground water.

The data will be used to implement prevention and response measures if pesticides are detected in concentrations less than or equal to Wyoming Ground-water Quality Standards; and response actions if pesticides are detected in concentrations that exceed Wyoming Ground-water Quality Standards.

Quality Assurance/Quality Control

The Quality Assurance/Quality Control (QA/QC) will be approved by the GPSC prior to implementation of the monitoring program and will be included in the WDEQ/WQD's Ground Water Quality Assurance Procedures Plan (QAPP).

Ground-water Sampling Procedures

The Ground-water Sampling and Analysis will be approved by the GPSC prior to implementation of the program and will be included in the WDEQ/WQD's Ground Water QAPP.

Ground-water Sample Analysis

All ground-water samples collected for pesticide analysis will be analyzed by the same laboratory for consistency in methodology and analytical reporting, when possible. The analytical laboratory will be responsible for following the QA/QC plan referenced in the SMP, or an equivalent QA/QC plan approved by the WDA and the WDEQ/WQD.

Minimum Set of Data Elements

To insure ground-water monitoring data can be communicated efficiently and shared within the ground-water community at all levels of government, participating agencies will attempt to report all data, generated by the pesticide ground-water monitoring program, in a format consistent with the "minimum set of data elements for ground water" presented in Appendix I.

PREVENTION ACTIONS

Introduction

A strategy designed to prevent ground-water contamination associated with the use of registered pesticides is presented in this component. Prevention actions include measures that will reduce or eliminate the risk or direct contamination of ground water, the risk of pesticides leaching into ground water in vulnerable areas, and the risk of ground water contamination resulting from normal agricultural practices.

The prevention strategy comprises both nonregulatory prevention and regulatory prevention and response actions. Nonregulatory actions do not have penalties assessed for noncompliance, allowing the pesticide user maximum flexibility in selecting appropriate practices for field-specific conditions. Detections above a Wyoming Ground-water Quality Standard may warrant regulatory actions (i.e., mandatory Best Management Practices (BMPs), pesticide product restrictions and/or prohibitions) with associated penalties.

Both prevention and response actions will be continually reevaluated. At a minimum, confirmed detections of a pesticide in ground water need to be treated as a cause for concern and will trigger some action to diagnose the cause of the particular detection and determine whether any further regulatory or management approaches are needed. Increasing concentrations of pesticides in ground water will warrant an increase in the intensity of the response action.

Technical Review Team

As shown on Figure 7-1, the Technical Review Team will comprise representatives from the Wyoming Department of Agriculture (WDA), Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD), the Wyoming State Engineer's Office (SEO), the U.S. Geological Survey (USGS), and the U.S. Environmental Protection Agency (EPA).

The Technical Review Team will meet subsequent to each ground-water monitoring event conducted in accordance with the Generic SMP to review the ground-water quality data. The Technical Review Team will provide an annual assessment of the ground-water monitoring program, and prepare an annual report for submittal to the GPSC.

The Technical Review Team may meet subsequent to any verified detection of concern. After a detection of pesticides in ground water has been verified, the Technical Review Team will meet, review the ground-water quality data, determine an appropriate response to the detection, and provide formal written recommendation(s) to the appropriate agency with responsibility for implementing the recommended response. The formal recommendation will also include suggestions for tracking the results of implementation of the recommended response. The Technical Review Team will be responsible for reviewing the results of any ground-water investigation or protection action they require on an annual basis, at a minimum.

FIGURE 7-1: PREDETECTION PREVENTION AND POST-DETECTION RESPONSE ACTIONS

PRE-DETECTION PREVENTION ACTIONS

PUBLIC OUTREACH

USER EDUCATION

PUBLIC EDUCATION

TECHNICAL ASSISTANCE

VOLUNTARY BEST MANAGEMENT PRACTICES

WELL CONSTRUCTION STANDARDS

REGULATORY ACTION

APPLICATOR TRAINING AND CERTIFICATION

PESTICIDE REGISTRATION

PESTICIDE REGULATIONS

POST-DETECTION RESPONSE ACTIONS

PUBLIC OUTREACH

NOTIFY AFFECTED PARTIES

ENHANCED USER EDUCATION

ENHANCED PUBLIC EDUCATION

TECHNICAL ASSISTANCE

VOLUNTARY BEST MANAGEMENT PRACTICES

PESTICIDE MANAGEMENT ZONES

ESTABLISH OR REEVALUATE PESTICIDE MANAGEMENT ZONES

REGULATORY ACTION

WELL CONSTRUCTION STANDARDS

APPLICATOR TRAINING AND CERTIFICATION

CHANGE IN PESTICIDE USE OR PRODUCT RESTRICTIONS AND/OR PROHIBITIONS

PROMULGATE EMERGENCY RULES

PROBLEM IDENTIFICATION MONITORING

RESPONSE MONITORING

GROUND-WATER INVESTIGATION

REMEDIATION

EVALUATION MONITORING

Collectively and/or individually, the agencies represented on the Technical Review Team have the regulatory authority to require a ground-water investigation, or protection actions, as appropriate.

Ground-water and Pesticides Strategy Committee

The primary responsibility of the Ground-water and Pesticides Strategy Committee (GPSC) is to develop the *Wyoming Generic State Management Plan for Pesticides and Ground Water* (SMP). As shown on Figure 7-1, the GPSC will also serve as a public oversight committee to the Technical Review Team. The GPSC does not have any regulatory authority. The GPSC provides a mechanism for the public to comment on the activities of the Technical Review Team relative to post-detection responses to pesticide detections in ground water. The composition and duties of the GPSC are further described in the "Introduction"; GPSC membership is provided in Appendices A and B.

The GPSC will meet on an annual basis at a minimum (more frequently, as needed), to 1) evaluate the success of preventive measures relative to pesticide use in Wyoming, 2) review the results of the Technical Review Team's responsible agencies' ground-water protection efforts in response to pesticide detections in ground water, 3) insure all affected parties are appropriately notified, and 4) insure public involvement in preventing ground-water contamination from the use of registered pesticides.

Prevention Strategy

The prevention strategy is directed at actions to prevent, reduce, or eliminate the risk of direct contamination or leaching of pesticides to ground water. Although Wyoming protects all ground water, including "currently used or reasonably expected sources of drinking water and ground water that is closely hydrologically connected to surface waters", prevention actions will be emphasized in areas where ground water has been assessed to be vulnerable and pesticides are used.

Pre-detection prevention actions are implemented before pesticides are detected in ground water. Post-detection response actions are used to prevent further contamination of ground water after pesticides have been detected in ground water. Both pre-detection prevention actions and post-detection response actions are shown on Figure 7-1. *All* pesticide detections in ground water will trigger a response action.

When a pesticide has been detected in ground water (the point of failure of the ground-water protection goal), actions will be taken to stop further contamination. As shown on Figure 7-1, these actions can range from enhanced user and public education, to modification of the way a pesticide is managed (including geographically defined prohibitions or moratoriums on pesticide use), to enforcement actions. General management approaches designed to prevent ground-water contamination associated with the use of registered pesticides are presented below. The discussion

of pre-detection prevention actions overlaps with post-detection response actions at the point that pesticide contamination is detected in ground water. At the point of pesticide detection however, prevention actions can still be pursued to prevent further contamination.

Pre-detection Prevention and Post-detection Response Actions

Pre-detection prevention actions are the initial ground-water protection measures implemented prior to detection of pesticides in ground water.

Post-detection response actions are developed and implemented subsequent to a detection of pesticides in ground water when additional and/or more stringent prevention measures are required to protect ground-water quality. Again, increasing concentrations of pesticides in ground water will warrant an increase in the intensity of the response action.

Pre-detection prevention measures and post-detection response actions include public outreach efforts as described below. Post-detection response actions may also include implementation of pesticide management zones and regulatory actions as described below.

Public Outreach

Public outreach activities can include 1) notification of affected parties, 2) user education, 3) public education, 4) technical assistance, 5) Best Management Practices (BMPs), and 6) well construction standards.

User Education

Educational programs for pesticide users are an integral component of the SMP. There are numerous avenues available to educate the wide variety of pesticide users in the state; from utilization of the mass media to educate the public about ground-water contamination in general, to site-specific technical assistance programs that directly address pesticide use patterns in relation to soil, cropping, and use practices. Education of users may include BMPs, and pesticide management zones (PMZs); technical assistance for weed and pest control, certification and licensing of pesticide applicators, and a variety of outreach efforts conducted by numerous agricultural entities.

An example of user education is the variety of commodity-specific weed and pest control guides published by the University of Wyoming - Cooperative Extension Service (UW-CES). These guides serve as an invaluable source of information to pesticide users on choosing an appropriate pesticide. The guides discuss characteristics of specific pesticides and provide recommendations for their use to control certain pest problems. Another example of user education is the aquifer sensitivity and ground-water vulnerability assessments conducted by the WDA,

WDEQ, and the Spatial Data Visualization Center (SDVC). This information is available to the public and will be instrumental in determining pesticide applications.

User education will serve as both a pre-detection prevention action and post-detection response action. If pesticide detections are confirmed in ground water, user education will be targeted at the management of the pesticide(s) of concern (including, but not limited to use, geohydrologic setting, disposal, etc.), and measures that involve enforceable use limitations may be implemented. If the level of a pesticide or breakdown product in ground water is found to be increasing toward the MCL, user education will again be targeted at the management of the pesticide of concern, and use prohibitions may be implemented.

Public Education

Not every pesticide user in Wyoming uses restricted-use pesticides. Therefore, an effort to reach general use consumers and applicators is an important prevention action. Applicators and users will be informed of the SMP and other ground-water protection actions through public meetings sponsored by the WDA, WDEQ, SEO, UW - CES, USGS, and SDVC, mailings to interested parties, news releases through the news media, etc.

Public education will serve as both a pre-detection prevention action and post-detection response action. If detections are confirmed in ground water, public education will be targeted at the management of the pesticide(s) of concern (including, but not limited to, general use, geohydrologic setting, disposal, etc.), and measures that involve enforceable use limitations may be implemented. If the level of a pesticide or breakdown product in ground water is found to be increasing toward the MCL, public education will again be targeted at the management of the pesticide of concern, and use prohibitions may be implemented.

Technical Assistance

Technical assistance on pesticides and the SMP is provided by the WDA, WDEQ, SEO, UW - CES, and SDVC, and many other local, state, and federal agencies (see "Roles and Responsibilities of State Agencies").

As an example, local conservation districts and the Natural Resource Conservation Service (NRCS) work cooperatively at the local level to develop and implement conservation plans with landowners for various federal, state, and local programs. These plans include BMPs and are tailored to meet the specific objectives of the farm operation while protecting both surface water and ground water.

Technical assistance will serve as both a pre-detection prevention action and post-detection prevention response action. Post-detection technical assistance will be targeted at the proper management of pesticide use in specific hydrogeologic settings.

Best Management Practices

The purpose of BMPs is to "prevent or control pesticides or toxic organic substances from entering the surface and subsurface waters of the state". BMPs for pollution control on cropland and pasture/hayland wastes are defined as "a practice, or combination of practices determined by a responsible group after examination of alternative practices and appropriate public participation to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with ground water and stream quality goals".

The WDA and UW - CES will encourage use and implementation of BMPs in vulnerable areas where pesticides are applied. Pre-detection prevention actions implementing BMPs are voluntary when pesticides have not been detected. Pesticide detections in ground water below or at a Wyoming Ground-water Quality Standard will warrant the WDA and UW - CES reevaluating the BMP and its application. However, post-detection response actions implementing BMPs remains voluntary. Pesticide detections above a Wyoming Ground-water Quality Standard will require mandatory implementation of a BMP and oversight by the WDA (see Figure 7-1).

BMP 595, "Pest Management", addresses ground-water protection from pesticide contamination. BMP 595 was developed jointly with the NRCS and is included in Appendix J. BMP 595, and other BMPs developed for water pollution control on cropland and pasture/hayland, are also included in the NRCS's Field Office Technical Guide which is available at local NRCS offices and soil conservation district offices upon request. Other pesticide-specific BMPs are also available, including "Factors Affecting Pesticide Leaching", which is available from the State of Utah Department of Agriculture upon request (Utah Department of Agriculture, 1989). Another valuable resource is the EPA publication, "Protecting Ground Water: Pesticides and Agricultural Practices, Document No. 440-6-88-001, February 1988, U.S. EPA/Office of Water". This document can be obtained from the EPA - Region 8's Environmental Information Service Center at 303/312-6312.

Pesticide Management Zones

The PMZ is a voluntary response initiated by the local community that may avoid a regulatory response from state and/or federal agencies (a complete description of PMZs is provided in Appendix L). The ultimate objective of a PMZ is to preserve registration of a valued pesticide for use by investigating and adjusting or modifying use of a pesticide product to prevent further contamination, increasing awareness of potential contamination problems among users, and encouraging greater care and selectivity where the pesticide is used.

Local communities will be responsible for forming a PMZ. PMZs will be structured within the Coordinated Resource Management (CRM) framework and should include representatives from pesticide manufacturers and users, the WDA, WDEQ/WQD, Weed and Pest Districts, County Extension Services, Wyoming Game and Fish Department, SEO, and interested parties from within the PMZ boundaries. County commissioners, local commercial applicators, individual users, crop

associations, product registrants, and University of Wyoming specialists could also be included on the PMZ committee. The PMZ committee will address pesticide contamination of ground water on a local level. The WDA and the WDEQ/WQD will be responsible for reviewing the effectiveness of PMZs.

To prevent ground-water contamination from pesticides, the PMZ committee will:

- Become a local, broad-based source of educational information and training to users within the PMZ;

- Review, evaluate, and recommend BMPs that may reduce or eliminate contamination;

- Recommend voluntary use pattern changes or other actions which may be necessary to achieve its stated goals; and

- Advise the Pesticide Board of Certification on local or statewide use restrictions that may be necessary.

The success of the PMZ will be measured by a high degree of public involvement, stable or declining pesticide concentrations, improved pesticide handling and use patterns, and continued registration of specific pesticides. PMZ committees will prepare an annual report for the Pesticide Board of Certification, outlining the year's activities, listing participants, and describing changes in use patterns associated with the PMZ. The report will summarize the value of the PMZ, and a recommendation as to whether or not the PMZ should be continued. Each PMZ will be evaluated by the Pesticide Board of Certification on an annual basis.

Implementation of PMZs will be voluntary as a post-detection response action when pesticides are detected below a Wyoming Ground-water Quality Standard. Post-detection use of PMZs as a response action will require the involved parties to continually reevaluate the PMZ. If the PMZ is in place and pesticide detections exceed a Wyoming Ground-water Quality Standard, regulatory actions may be possible (see Figures 7-1 and 8-1).

Regulatory Actions

Well Construction Standards

Improper seals on active or abandoned wells provide direct pathways for pesticides and agricultural runoff to reach ground water and possibly impact drinking water supplies. Proper construction of wells minimizes the potential for direct transmission of pesticides down the borehole and into ground water.

The SEO - Ground-water Division will evaluate and review water well construction and enforce the Water Well Minimum Construction Standards. The SEO's regulations provide standards for well casings, seals, and surface completions and for proper well abandonment or destruction. "Removed from service" wells are required to be capped to prevent entry or plugged to prevent the well from being a vertical conduit for the transmission of contaminants.

The WDEQ/WQD's Water Quality Rules and Regulations Chapter XI, Part G, "Well Construction", also provides minimum standards for design and construction, and abandonment of ground-water monitoring, remediation, and public water supply wells to protect ground water of the state.

Enforcement of well construction standards by the SEO and WDEQ/WQD will serve as a pre-detection prevention action.

Post-detection responses can include attachment of permit conditions by the SEO. By statute, the SEO is “authorized and empowered to require the abatement of any condition, or the sealing of any well, responsible for the admission of polluting materials into an underground water supply” (§41-3-909(a)(viii)). Under advice and consent of WDA and/or WDEQ, the SEO has the immediate ability to attach limitations and conditions to well permits as necessary at locations or areas of concern which would address particular well construction or sealing requirements.

Applicator Training and Certification

Wyoming has an EPA-approved certification program for all applicators that apply or supervise the application of restricted-use pesticides, and commercial applicators who apply any pesticide for contract or hire.

The WDA, in cooperation with the UW-CES, is responsible for conducting certification and re-certification workshops on an annual basis to educate and train persons who use and handle pesticides. The only way to become certified as a commercial applicator is through examination. The initial certification training offered to these individuals consists of a three-day course for commercial applicators, and a one half-day course for private applicators. Recertification training includes a one and one half-day course for commercial applicators and a one half-day course for private applicators. Label compliance and ground-water protection have been included as integral parts of these training courses.

If it is determined that standards for the certification of private or commercial applicators must be more stringent than the standards in Section 5 or Section 9 of the Wyoming Applicator Certification Rules and Regulations, and, additional special identification is necessary for an individual using a highly toxic pesticide or applying a pesticide which has been demonstrated to be particularly hazardous to the environment, the standards for the applicator may include, in addition to the applicator's category standards, an especially high degree of knowledge concerning the compound's action, its' limitations, and the areas in which it is to be applied (Chapter 28, Applicator

Certification Rules and Regulations, Section 11, "Pesticides Subject to Other Restrictions as Provided by the Board of Certification").

Applicator training and certification will serve as both a pre-detection prevention action and post-detection response action.

Pesticide Registration

Prior to use in Wyoming, all pesticide products must be registered with the EPA and the WDA. The registration requirement insures to both the user and the public that the product has undergone extensive testing, and if used according to the label, should not result in any adverse affects on humans and/or the environment.

As shown on Figure 7-1, pesticide registration is a pre-detection prevention action. Pesticide registration can also become a post-detection response action. Detections of pesticides in ground water, below or at a Wyoming Ground-water Quality Standard, may warrant a change in pesticide use, as directed by the WDA. Detections of pesticides in ground water above a Wyoming Ground-water Quality Standard may warrant a change in pesticide use, or pesticide product restrictions and/or prohibitions, as directed by the WDA.

Pesticide Regulations

The WDA enforces rules and regulations governing:

- Pesticide Use, Storage, Labeling, Distribution, Transportation, and Disposal;
- Pesticide Application Limitations;
- Equipment Inspection; and
- Dealer Licensing.

The Wyoming Environmental Pesticide Control Act allows the WDA to promulgate emergency rules and allows promulgation of regulations which may restrict or prohibit use of pesticides in designated areas during specified periods of time (see "Legal Authority").

Enforcement of pesticide regulations by the WDA will serve as both a pre-detection prevention action and post-detection prevention response action.

Monitoring

As discussed in “Monitoring”, regulatory actions may include Problem Identification Monitoring, Response Monitoring (with the associated Ground-water Investigation and Remediation), and/or Evaluation Monitoring.

Coordination with the EPA

Wyoming will make every effort to coordinate the state's prevention actions with existing prevention actions under EPA programs such as the Nonpoint Source, Wellhead Protection, Comprehensive State Ground-water Protection Programs, label requirements, and applicator certification. Prevention actions will also be coordinated with the NRCS's Conservation Compliance Plan.

RESPONSE TO DETECTIONS OF PESTICIDES

Introduction

This component describes how the Technical Response Team will respond to pesticide detections in ground water to insure Wyoming Ground-water Quality Standards will not be reached, and actions taken in the event that Wyoming Ground-water Quality Standards are reached and/or exceeded.

The purpose of responding to detections of pesticides in ground water is to 1) limit the risks of adverse effects to human health, and 2) to restore ground water to its highest protected use whenever such restorations are practicable and attainable (see "State's Philosophy and Goals Toward Protecting Ground Water").

Wyoming ground-water protection laws and the philosophies of state agencies responsible for the promulgation of rules, regulations, and policies concerning ground-water use and pesticide application have a common objective, and that is to protect *all* ground-water resources of the state. Therefore, use and value of the ground-water resource will generally not affect the level of response.

Technical Review Team

After a pesticide detection in ground water has been verified, the Technical Review Team (see "Prevention Actions") will meet, review the ground-water quality data, and determine an appropriate response to the detection. All responses will be initiated in a timely manner, dependent upon available resources. The Technical Review Team will comprise representatives from the Wyoming Department of Agriculture (WDA), Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD), the Wyoming State Engineer's Office (SEO), the U.S. Geological Survey (USGS), and the U.S. Environmental Protection Agency (EPA). *Collectively and/or individually, the agencies represented on the Technical Review Team have the regulatory authority to require a ground-water investigation or protection action, as appropriate.*

Ground-water and Pesticides Strategy Committee

The Ground-water and Pesticides Strategy Committee (GPSC) will serve as a public oversight committee (see "Prevention Actions"). The GPSC will meet on an annual basis at a minimum (more frequently, if needed) to 1) evaluate the success of preventive measures relative to pesticide use in Wyoming, 2) review the results of the responsible agencies within the Technical Review Team's ground-water protection efforts in response to pesticide detections in ground water, 3) insure all affected parties are appropriately notified, and 4) insure public involvement in preventing ground-water contamination from the use of registered pesticides.

Response Strategy

All pesticide detections in ground water will trigger some action to diagnose the cause of the particular detection and determine whether any further regulatory/management approaches are needed.

Wyoming's response to pesticide detections is based primarily on the concentration of pesticides detected in ground water, and ascertaining whether contamination resulted from normal use in accordance with label directions and other requirements, or from misuse or accident.

Factors such as volume and frequency of pesticide use, leachability of the pesticide, exposure pathways, and vulnerability of the affected area will also be considered on a site by site basis when determining an appropriate response.

A general corrective response scheme is summarized on Figure 8-1. The aggressiveness of the response will be based on the extent and magnitude of pesticide concentrations in ground water, as observed from ground-water monitoring activities. Figure 8-1 shows potential post-detection response actions in order of increasing aggressiveness. Criteria associated with different response actions, considering the extent, magnitude, and trends of pesticide concentrations detected in ground water, will be developed for individual pesticides in conjunction with future pesticide specific SMP's.

Detection of Pesticides in Ground Water

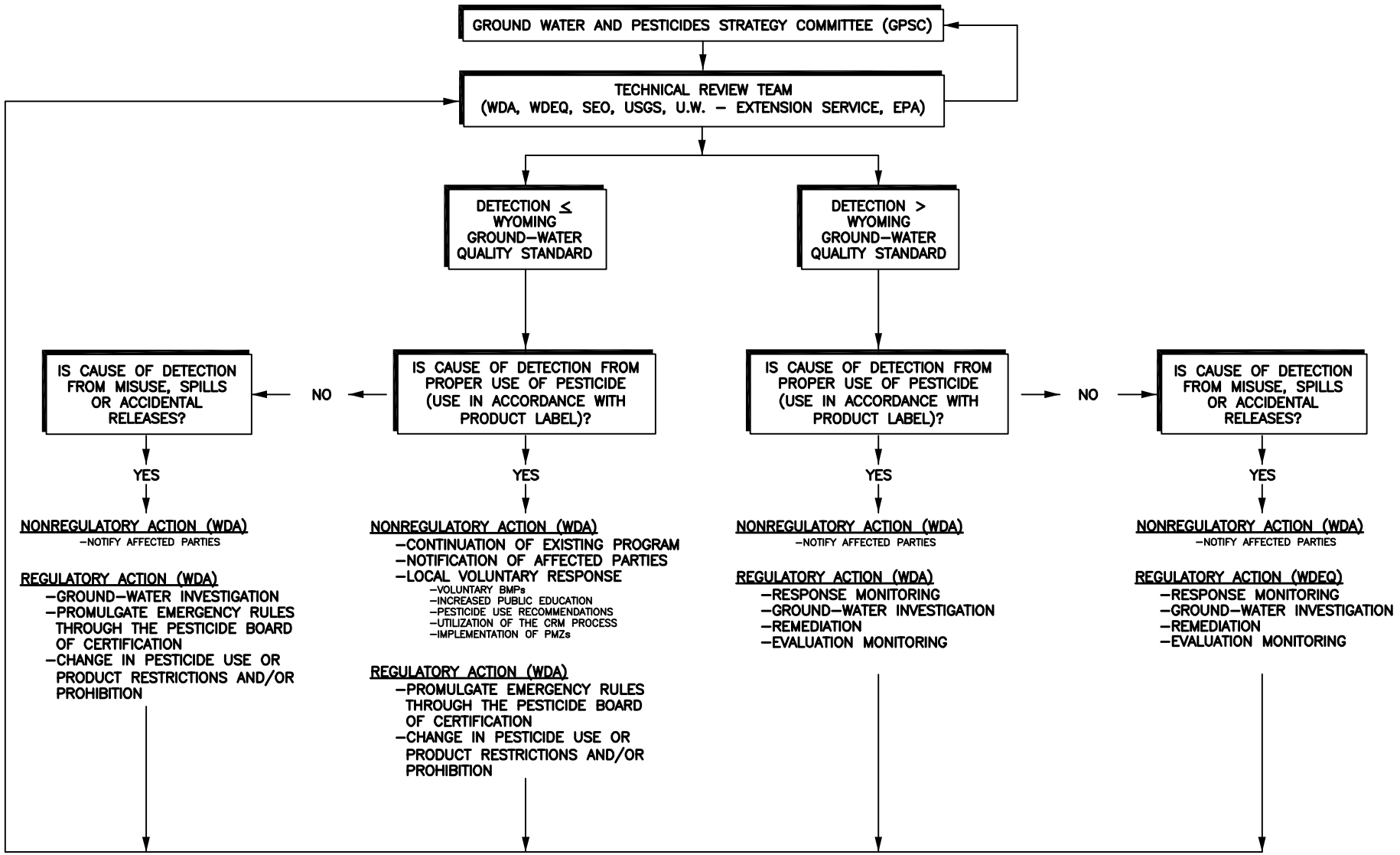
Pesticide contamination of ground water may be detected through the ground-water monitoring programs described in "Monitoring". These programs are designed to allow early detection of changes in ground-water quality resulting from pesticide contamination. Early detection of ground-water contamination will allow early response by the Technical Review Team so existing and potential use of the ground-water resource will not be lost. These monitoring programs will be prioritized to areas where ground water is most vulnerable to pesticide contamination based on ground-water vulnerability assessments.

Pesticide contamination may also be identified through existing regional ground-water monitoring programs, public water supply monitoring programs, and voluntary monitoring of private well water quality. Additionally complaints received from the public regarding pesticides in ground water will be investigated by the Technical Review Team.

Pesticide detections in one area may trigger a response not only in that area but in other areas of the state with similar hydrogeologic settings and correlative pesticide use.

FIGURE 8-1: POTENTIAL POST-DETECTION RESPONSE ACTIONS

(ACTIONS ARE SHOWN IN INCREASING LEVELS OF AGGRESSIVENESS)



Determination of Cause

The Technical Review Team will review investigation work conducted in response to public complaints (i.e., pesticide in ground water monitoring results) and determine whether a pesticide detection in ground water is the result of 1) normal pesticide use according to label directions, or 2) misuse, a spill, or an accidental release. Once the cause, concentration, and historical concentration trends are identified, the Technical Review Team will determine an appropriate response with an associated time frame to respond to the pesticide contamination, and provide formal written recommendation(s) to the appropriate agency with responsibility for implementing the recommended response.

Although the Wyoming Environmental Pesticide Control Act authorizes the WDA to conduct an initial site investigation, limited resources may prohibit the WDA from conducting a site investigation of each pesticide detection. At a minimum, the WDA will conduct telephone interviews to collect site-specific information (e.g., the type of pesticide used, land use patterns in the affected area, any reports of accidental releases, prior or current contamination of adjacent wells, application practices, etc.) and attempt to isolate the cause of contamination. Once the probable cause of contamination has been determined, the Technical Review Team will evaluate the pesticide detection based on the nature and concentration of pesticide detected in ground water and determine an appropriate response.

In some instances, the cause (e.g., normal use, misuse, spillage, accidental release, illegal discharge, etc.) and/or person(s) responsible for causing or allowing a violation of a Wyoming Ground-water Quality Standard by pesticides cannot be readily determined from existing information. Resolving the violation then becomes complex, difficult, and potentially impossible since the Technical Review Team is not provided with funding to perform the necessary subsurface investigations to determine the cause and/or responsible party. The WDEQ/WQD will attempt to obtain funding, from either the Governor's Contingency Fund and/or the pesticide and fertilizer registration fee fund administered by the WDA's Natural Resources and Policy Section, to perform subsurface investigations, emergency response, and corrective measures.

Based on a determination of the cause of contamination and the risks associated with the contamination, technical and management information may be combined to determine how to prevent future occurrences of a similar nature.

Pesticide Detections Resulting from Normal Use

The Technical Review Team’s process for determining an appropriate response to pesticide detections resulting from normal use is described below and is summarized on Figure 8-1.

Detections Below or At Wyoming Ground-water Quality Standards

Each detection will be addressed individually, on a case by case basis.

If pesticides are detected in ground water in concentrations below or at Wyoming Ground-water Quality Standards and are the result of normal use, actions such as restricting or prohibiting use may be taken with respect to use of the pesticide in the affected area. Detections below Wyoming Ground-water Quality Standards will also trigger actions to prevent contamination with the potential to pose risks to human health and the environment. The WDA may implement either a nonregulatory or regulatory response to the detection.

Nonregulatory Response

Nonregulatory responses to pesticide detections in ground water include:

- Continuation of Existing Program: No action beyond simply continuing to monitor ground water in the affected area. If the WDA chooses not to take any action on a pesticide detection, local governments currently have the authority to regulate pesticide use on their own (6/99). Ongoing prevention actions would be maintained.

- Local Voluntary Response Actions: Assisting the affected community with voluntarily addressing the ground-water contamination at a local level.

In an effort to avoid having the Pesticide Board of Certification place additional restrictions on pesticide use in the affected area, the WDA will encourage the local community to respond to the contamination at the local level through voluntary implementation of BMPs (see Appendix J), increased public education, and pesticide use recommendations without intervention from state agencies. The nonregulatory response may include utilization of the Coordinated Resource Management (CRM) process (see Appendix K) and implementation of a functional Pesticide Management Zone (PMZ) (see Appendix L).

A PMZ, established through the CRM process, is the local community's last option of responding to pesticide contamination on its own, without regulatory intervention. Failure of the PMZ to progress toward, or achieve, its goals on a voluntary basis may result in a regulatory response (e.g., increased regulation by the Pesticide Board of Certification over use of the specific pesticide, and possible cancellation of use within the PMZ, or on a state-wide basis if warranted). If a PMZ is already in place, the GPSC will evaluate the success of the PMZ relative to preventing further ground-water contamination

Pesticide detections below or at Wyoming Ground-water Quality Standards will require notification of potentially impacted parties and area pesticide users. The Technical Review Team will be responsible for beginning notification efforts within 30 days of knowledge of the detection.

Regulatory Response

If the local community does not address ground-water contamination to the satisfaction of the GPSC, or if pesticide concentrations in ground water appear to be increasing, the WDA may implement a regulatory response to a detection of pesticides in ground water.

The WDA has the existing statutory authority to promulgate emergency rules; promulgate regulations relating to the time, place, manner, methods, materials and amounts and concentrations of pesticide application; require registration of pesticides; refuse to register a pesticide; cancel or suspend registration of a pesticide; and promulgate regulations which may restrict or prohibit use of pesticides in designated areas during specified periods of time through the Pesticide Board of Certification (see "Legal Authority"). If the Pesticide Board of Certification determines additional restrictions are necessary, they must go through the rulemaking process in accordance with the Administrative Procedures Act.

Detections Above Wyoming Ground-water Quality Standards

Continued detection of pesticides in ground water above Wyoming Ground-water Quality Standards, subsequent to the implementation of the SMP, will signify the failure of the prevention goal.

If pesticides are detected in ground water in concentrations above Wyoming Ground-water Quality Standards and are the result of proper use, the WDA will enforce Wyoming's Environmental Pesticide Control Act of 1973 through the Pesticide Board of Certification. Pesticide detections in ground water above Wyoming Ground-water Quality Standards are a violation of the Wyoming Environmental Quality Act and will be enforced by the WDEQ/WQD.

The Technical Review Team will notify all affected or potentially affected parties. Notification efforts will be initiated immediately upon knowledge of the detection (see "Public Awareness and Participation").

Through the provisions of the Wyoming Environmental Quality Act, the WDEQ/WQD will require the pesticide registrant to:

- Conduct response monitoring;

- Conduct a ground-water investigation (to determine the nature and extent of soil and/or ground-water contamination);

- Remediate the site (treat, contain, dispose, and/or monitor contaminated soil and ground water) or implement prevention actions (i.e., implement BMPs, change pesticide usage, etc.); and

- Conduct evaluation monitoring.

If the pesticide registrant refuses to cooperate, the WDA and WDEQ/WQD may require the landowner and/or pesticide applicator to undertake and implement response monitoring, a ground-water investigation, remediation or implementation of prevention actions, and evaluation monitoring.

Pesticide Detections Resulting from Misuse, Spills, and Accidental Releases

The Technical Review Team's process for determining an appropriate response to pesticide detections resulting from misuse, spills, and accidental releases is described below and is summarized on Figure 8-1.

When pesticide contamination of ground water is the result of activities in violation of existing state laws (e.g. misuse, spills, back siphoning, soil loading with pesticides at mixing sites, etc.), the responsible party(ies) will be subject to a regulatory response by the WDA and WDEQ/WQD. Pesticide misuse (use of any registered pesticide in violation of the Wyoming Environmental Pesticide Control Act of 1973) is prohibited.

The Technical Review Team will notify all affected parties. All detections above Wyoming Ground-water Quality Standards will require notification of both area pesticide users and ground-water users. Notification efforts will be initiated immediately upon knowledge of the detection (see "Public Awareness and Participation").

The WDEQ/WQD will enforce the Wyoming Environmental Quality Act and may require the landowner and/or pesticide applicator that caused or allowed the contamination to:

- Conduct response monitoring;

- Conduct a ground-water investigation (to determine the nature and extent of soil and/or ground-water contamination);

- Remediate the site (treat, contain, dispose, and/or monitor contaminated soil and ground water) or implement prevention actions (i.e., implement BMPs, change pesticide usage, etc.); and

- Conduct evaluation monitoring.

Pesticide spills and/or other "releases", as defined by Section 3(d) of Chapter IV of the WDEQ/WQD's rules and regulations, "Regulations for Releases of Oil and Hazardous Substances into Waters of the State of Wyoming", require reporting, containment, cleanup and disposal of any oil or hazardous materials (including pesticides) which are spilled.

Alternative Safe Drinking Water Supplies

If pesticides are detected in private drinking water supplies in concentrations that exceed Wyoming Ground-water Quality Standards, an alternative water supply for the well users will be pursued.

However, the Wyoming Environmental Quality Act does not provide explicit authority for the WDEQ/WQD to require the replacement of a ground-water source lost to pesticide contamination. The WDEQ/WQD will negotiate with the responsible party through settlement of a violation to attempt to provide an alternate supply or treatment to meet acceptable Wyoming Ground-water Quality Standards.

Pursuant to Appendix I of the "Wyoming Oil and Hazardous Substances Contingency Plan", the Governor's Contingency Fund may provide funds to contain, clean up, remove, or provide, an alternative public water supply or drinking water supply where the responsible party of a spill or other release is unknown or will not take required action.

Under the expanded authority of the 1986 Safe Drinking Water Act (SDWA), EPA may issue orders requiring the provision of alternative water supplies by the party(ies) who caused or contributed to the endangerment.

EPA may also enforce against Public Water System (PWS) violations of Maximum Contaminant Levels (MCLs) when state or local authorities have not acted to protect public health. EPA is developing MCLs pursuant to the schedules of the 1986 Amendments. Prominent among the chemicals invoked by the SDWA are pesticides with evidence of potential to contaminate drinking water supplies. The addition of these MCLs will be used by the EPA to address contamination incidents involving these chemicals. EPA will consider use of SDWA's emergency powers, including the pursuit of responsible parties, where ground water contaminated with pesticides poses an imminent and substantial endangerment to human health.

ENFORCEMENT MECHANISMS

Although pesticides and pest control devices are valuable to Wyoming's agricultural production and to the protection of man and the environment from insects, rodents, weeds, and other forms of life which may be pests, it is essential to the public health and welfare that they be regulated closely to prevent adverse effects on human life and the environment.

Three state agencies have enforcement responsibilities relative to the *Wyoming Generic State Management Plan for Pesticides and Ground Water* (SMP); the Wyoming Department of Agriculture (WDA), Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD), and the Wyoming State Engineer's Office (SEO).

Wyoming Department of Agriculture

Authorities

The WDA will use the powers granted by the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and Wyoming's Environmental Pesticide Control Act of 1973 (the Act of 1973) to implement the SMP.

Wyoming Environmental Pesticide Control Act

The purpose of the Act of 1973 (Wyoming Statute (W.S.) §35-7-350 to §35-7-374) is to regulate the labeling, distribution, storage, transportation, disposal, use and application of pesticides used to control pests. The dissemination of accurate scientific information as to the proper use or non-use, of any pesticide, is vital to the public health and welfare, and the environment, both immediate and future. Therefore, it is deemed necessary to provide for registration of pesticides and devices.

The Act of 1973 also allows the WDA to cooperate with and enter into any agreements with any other agency of the state, the U.S., and any other state or agency thereof for the purpose of carrying out the provisions of the Act of 1973 and securing uniformity of regulation.

Federal Insecticide, Fungicide and Rodenticide Act

The WDA has pesticide-user certification primacy under FIFRA. The WDA does not have enforcement primacy under FIFRA, but does have enforcement primacy under the Wyoming Environmental Pesticide Control Act. The WDA is developing a cooperative agreement with the EPA to delineate duties and responsibilities covering potential gaps and/or duplicate efforts in administration of the pesticide enforcement program. The WDA refers pesticide violation cases or problems to the EPA if the severity of the non-compliance is warranted.

Enforcement Capabilities

As referenced in the "Monitoring", "Prevention Actions", and "Response to Detections of Pesticides" portions of the SMP, the WDA has the enforcement capability necessary to:

- Regulate the use and application of pesticides;
- Promulgate emergency rules;
- Promulgate regulations relating to the time, place, manner, methods, materials, amounts, and concentrations in connection with the application of pesticides;
- Require pesticides to be registered with the WDA and allow the Director of the WDA to refuse to register a pesticide, cancel or suspend registration of a pesticide; and
- Require licensing of commercial and private pesticide applicators.

The Act of 1973 allows the WDA to hold pesticide users liable for any damage to the person or lands of another caused by the use of pesticides, even though pesticide use conforms to the rules and regulations of the Act of 1973.

The Act of 1973 also allows the WDA to assess penalties (i.e., convictions and/or fines) of any violation of the Act of 1973, and for legal actions brought by the Director to enjoin the violation or threatened violation of any provision of any regulation of the Act of 1973. The Director of WDA may also institute criminal proceedings against violators of the Act of 1973. The WDA will also use the “WDA Enforcement Policy” (dated 3/99) in determining any applicable enforcement action by the WDA.

The Act of 1973 allows the WDA to enter upon any public or private premises to:

- Inspect lands actually, or reported to be, exposed to pesticides;
- Inspect storage or disposal areas; and/or
- Investigate complaints of injury to humans or land.

If denied access to any private or public premises, the Director of the WDA may apply for a search warrant authorizing access.

Compliance Activities

WDA inspectors conduct the following routine inspections to insure compliance with the state's pesticide regulations:

- Pesticide misuse (misapplication);

- Pesticide misuse (label violations);

- Dealer/applicator violations (including record keeping); and

- Marketplace violations.

These inspections are usually conducted on an irregular basis and are unannounced.

Wyoming Department of Environmental Quality/Water Quality Division

Authorities

The WDEQ/WQD has authority under the Wyoming Environmental Quality Act, and rules and regulations promulgated thereunder, to implement responsibilities under the SMP.

Wyoming Environmental Quality Act

The purpose of the Wyoming Environmental Quality Act (the Act) is to enable the State of Wyoming to:

- Prevent, reduce, and eliminate pollution;

- Preserve and exercise the primary responsibilities and rights of the State of Wyoming;

- Retain for the state the control over its air, land and water; and

- Secure cooperation between agencies of the state, agencies of other states, interstate agencies, and the federal government in carrying out these objectives (W.S. §35-11-102).

The Act also provides the WDEQ/WQD with the authority to:

- Investigate and resolve violations of the Act;

- Designate representatives of the WDEQ/WQD to enter and inspect any property except private property on or at which a water pollution source is located or is being constructed or installed; and

- Require monitoring of point sources.

Comprehensive Environmental Response, Compensation and Liability Act

The source and circumstances of contamination at a site is an important consideration in determining the appropriate authority for responding to contamination. Under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), also known as Superfund, EPA has the authority to clean-up contamination and recover the costs of these actions from responsible parties. Cost-recovery, however, is specifically excluded by the CERCLA statute for contamination "resulting from the application of a pesticide product registered under FIFRA, Section 107(i). Recovery of cost from responsible parties is a possibility, however, when contamination is a result of either illegal use or disposal, or accidental releases.

The EPA, WDA, and WDEQ/WQD will take advantage of the CERCLA enforcement authorities by closely coordinating efforts under FIFRA and the SDWA with those of CERCLA. EPA may consider providing CERCLA Fund financing for immediate, short-term response actions on a case-by-case basis. Actions under CERCLA's Removal Program generally provide for short-term responses to mitigate or eliminate imminent human health threats, such as providing alternative drinking water. EPA may seek cost recovery when contamination results from leaks, spills or misuse and a responsible party is identified.

Enforcement Capabilities

As referenced in the "Monitoring", "Prevention Actions", and "Response to Detections of Pesticides" portions of the SMP, the WDEQ/WQD has the enforcement capability necessary to:

- Provide for an emergency order or resolution of a Wyoming Ground-water Quality Standard violation utilizing enforcement action under Article 7 or 9 of the Environmental Quality Act, allows the WDEQ/WQD to prohibit the use of a pesticide in a specific area. This prohibition would be directed at a person who controls pesticide application in a particular area and not the area itself; and

- Require the responsible person, or in cases where the responsible party is not known or is incapable of taking corrective action, to require the land owner (person allowing pollution without a permit for any violation of the Act, any rules, or permits) to correct or remedy the violation.

Any person causing or allowing a violation of the Wyoming Ground-water Quality Standard is subject to the penalty provisions of the Act.

Compliance Activities

The Act requires the WDEQ/WQD to conduct programs of continuing surveillance, and regular periodic inspections of all actual or potential sources of pollution.

Wyoming State Engineer's Office

Authorities

The SEO will use the authority provided by the Wyoming Constitution, state statutes, and the specific guidelines and standards of the SEO's Regulations and Instructions, to implement the SMP.

The Wyoming Constitution

The Wyoming Constitution declares all waters within the boundaries of the state to be property of the state and grants general supervision of those waters to the State Engineer.

Enforcement Capabilities

The SEO has the statutory authority to:

- Establish standards for the construction of wells; and

- Provide guidelines for proper well abandonment or destruction.

The SEO also has the following authorities to respond to contamination of ground water by pesticides:

- To make such investigations as may be necessary or desirable, and to cooperate with agencies of the U.S., Wyoming, other states, political subdivisions of Wyoming, any public or private corporation, or any association or individual. However, this authority is directed more at determining the occurrence, quantity, and use of ground-water resources rather than quality; and

- Require the abatement of any condition, or the sealing of any well, responsible for the admission of polluting materials into an underground water supply. There is no specific authority to allow the SEO to require restoration of any damage caused by the polluting material.

Compliance Activities

Due to a lack of resources, the SEO does not conduct regular inspections to determine proper well construction/abandonment. The SEO does respond to complaints on an as-needed basis.

U.S. Environmental Protection Agency - Region 8

Enforcement

EPA may enforce against Public Water System (PWS) violations of Maximum Contaminant Levels (MCLs) when state or local authorities have not acted to protect public health. EPA is developing MCLs pursuant to the schedules of the 1986 Amendments. Prominent among the chemicals invoked by the SDWA are pesticides with evidence of potential to contaminate drinking water supplies. The addition of these MCLs will be used by the EPA and states (with primacy to enforce these national standards among PWSs) to address contamination incidents involving these chemicals. EPA will consider use of SDWA's emergency powers, including the pursuit of responsible parties, where ground water contaminated with pesticides poses an imminent and substantial endangerment to the health of persons.

The EPA may regulate the design, construction, and location of sites at which pesticides are stored or where mixing and sprayer loading of pesticides will occur. The EPA also regulates the design of irrigation systems used for the application of pesticides, and determines which pesticides will require SMP's as the basis for continuing a pesticide's registration in designated states (EPA, 1990).

Wyoming does not have primacy over the drinking water program. Therefore, EPA - Region 8 has enforcement authority for the SDWA. EPA - Region 8's legal authorities, as they relate to the implementation of the SDWA in Wyoming are as follows:

- Wyoming does not have primacy for the Public Water Supply System (PWSS) program and the EPA - Region 8 office implements the program;

- Public Water Systems (PWS) are periodically required to monitor for thirty three pesticides;

- Monitoring frequency is increased if a pesticide is detected;

- The SDWA allows a monitoring waiver program to be developed that allows PWS to forego monitoring (and save thousands of dollars) if a vulnerability assessment is performed on the source water (Note: EPA is currently not implementing such a program);

- Public notification to consumers is required if a pesticide MCL is exceeded, or if it is not monitored as required;

- EPA has administrative enforcement and civil penalty authority for violation of any National Primary Drinking Water regulation; and

- EPA has emergency enforcement authority upon learning that "...a contaminant which is present in or is likely to enter a public water system or an underground source of drinking water may present an imminent and substantial endangerment to the health of persons..." (Schmidt, 1996).

PUBLIC AWARENESS AND PARTICIPATION

Introduction

Public participation is an integral part of the development, implementation and success of the *Wyoming Generic State Management Plan for Pesticides and Ground Water* (SMP). Allowing the interested public to provide input, guidance, direction and experience in development of the SMP helped insure public participation, general acknowledgement of the SMP, and future implementation of the SMP.

The following discussion documents the process by which development and implementation of Wyoming's SMP is subject to public involvement and review.

The Public Role in the Development of the SMP

The Wyoming Environmental Quality Act and the Wyoming Administrative Procedures Act insures public participation in the development of the SMP.

The Wyoming Department of Agriculture (WDA) invited approximately 60 representatives from the general public, various state and federal agencies, the Nonpoint Source Task Force, the U.S. Environmental Protection Agency (EPA) - Region 8, the pesticide industry, applicators, environmental organizations, agricultural organizations, and individuals impacted by pesticide use, to participate on the Ground-water and Pesticides Strategy Committee (GPSC). Members of the GPSC (see Appendix A) were responsible for development of Wyoming's SMP. GPSC meetings, which were open to the public, were held on a monthly basis during development of the SMP. It was also the responsibility of each member to insure his or her constituency was apprised of the development of the SMP, and was invited to actively participate. To insure additional public input during the development of the SMP, each component of the SMP was subjected to review and comment by approximately 40 additional individuals who formed the GPSC "advisory group" (see Appendix B).

The complete SMP was submitted to the Wyoming public for review and comment. Copies of the SMP were placed in each county library; the Wyoming Department of Environmental Quality's district offices in Cheyenne, Casper, Sheridan, and Lander; and the Wyoming State Engineer's Office/Water Division's field offices in Torrington, Sheridan, Riverton, and Cokeville for public review. A cover letter, explaining the purpose of the SMP, was attached. The WDA and WDEQ/WQD encouraged participation in the public review process by providing news releases to widely circulated newspapers in the state. The public was notified of the availability of the SMP during the first week of May 1995. The 45-day public review and comment period extended from May 8 through June 21, 1995. Additional copies of the SMP were submitted to the Board of Agriculture, the Nonpoint Source Task Force, the Water Quality Advisory Board, the Wyoming Attorney General's office, the State Engineer's Office, the Governor's Office, pesticide manufacturers, the co-chairs of the GPSC, the directors of various state agencies active in the

development and implementation of the SMP, and the EPA - Region 8 for their review and comment.

The WDA received minimal comments on the SMP. All written comments were considered by the GPSC and incorporated into the SMP where appropriate.

The Public Role in Decision-Making in Implementing the SMP

The public will have the opportunity to participate in decision-making activities associated with significant SMP implementation through the Wyoming Administrative Procedures Act. Public input in prevention and response measures of the SMP is provided through the following mechanisms:

- In the event a pesticide is identified as needing restriction, the WDA through the Pesticide Board of Certification has existing legal authority to require additional restrictions on specific pesticide products, require Pesticide Management Zones (PMZs), require more stringent Best Management Practices (BMPs), etc. If the Pesticide Board of Certification determines additional restrictions are necessary, the Pesticide Board of Certification must go through the rulemaking process in accordance with the Administrative Procedures Act. Public participation in the rulemaking process is insured through public meetings and public hearings in accordance with the Administrative Procedures Act; and

- The WDA, in consultation with the WDEQ/WQD, also has existing statutory authority to promulgate emergency rules; promulgate regulations relating to the time, place, manner, methods, materials and amounts and concentrations of pesticide application; require registration of pesticides; refuse to register a pesticide; cancel or suspend registration of a pesticide; and promulgate regulations which may restrict or prohibit use of pesticides in designated areas during specified periods of time through the Pesticide Board of Certification (see "Legal Authority" and "Enforcement Mechanisms"). If the Pesticide Board of Certification determines additional restrictions are necessary, they must go through the rulemaking process in accordance with the Administrative Procedures Act. Public participation in the rulemaking process is insured through public meetings and public hearings in accordance with the Administrative Procedures Act.

How, When, and By Whom will the Public be informed of Detections?

How Will the Public be Notified?

The Technical Review Committee will be responsible for notifying the public of pesticide detections in ground water. The Technical Review Committee will notify private well owners

and/or users in writing of the analytical results for ground-water samples collected from their wells. Any significant detections of pesticides (detections at or above Wyoming Ground-water Quality Standards) will be noted. An explanation of potential health risks associated with the constituent(s) detected will be provided, as well as other available information on the constituent (i.e. EPA Fact Sheets on specific pesticides). A contact (either WDA, WDEQ/WQD, and/or EPA-Region 8) will be provided for additional information relative to the detection. Additionally, WDA, or WDA and WDEQ/WQD, will provide public awareness of the pesticide detection above standards to potentially impacted parties through mailings or personal contact (due to Wyoming's small population and geographical isolation, localized forms of communication are effective and reach the vast majority of the target audience). Local Conservation Districts might also provide a public forum for providing the potentially impacted public with ground-water monitoring results.

When Will the Public be Notified?

The well owner/affected user(s) will be notified of pesticide detections in ground water, above Wyoming Ground-water Quality Standards, within 30 days of knowledge of the detection.

By Whom Will the Public be Notified?

The Technical Review Team will be responsible for notifying the public of pesticide detections in ground water:

- All detections above Wyoming Ground-water Quality Standards will require notification of both area pesticide users and ground-water users. The WDA and the WDEQ/WQD will be responsible for beginning immediate notification efforts upon the Departments' knowledge of the detection; and

- Pesticide detections below or at Wyoming Ground-water Quality Standards may require notification of potentially impacted parties and area pesticide users. The WDA will be responsible for beginning notification efforts within 30 days of the Department's knowledge of the detection.

NOTE: For community and non-community public water supplies, the responsibility of notifying users that their drinking water contains pesticides at concentrations equal to or exceeding Wyoming Ground-water Quality Standards usually resides with the municipality, owner/landlord, or utility.

INFORMATION DISSEMINATION

Introduction

Pesticide users are responsible for directly controlling the use of pesticides in the field. Therefore, users need to have a good understanding of the potential for pesticides to contaminate ground water. Prevention actions (e.g. use limitations and precautions) prescribed in the *Wyoming Generic State Management Plan for Pesticides and Ground Water* (SMP) must be communicated to pesticide users, appropriate industry groups, and regulatory officials. Information provided in the SMP will be disseminated through the following mechanisms:

- The "State Program for Certification and Training of Private and Commercial Pesticide Applicators";
- Supplemental pesticide labeling;
- Education; and
- Various outreach efforts.

Pesticide Certification and Training Program

The Wyoming Department of Agriculture (WDA) disseminates pesticide regulation information, developed by the WDA Board of Certification, to pesticide users through various agencies, including the University of Wyoming Cooperative Extension Service (UW - CES). In cooperation with the UW - CES, the WDA conducts annual certification and re-certification workshops to educate and train private and commercial pesticide applicators who use and handle pesticides.

The UW - CES is responsible for procuring and developing training materials and developing and conducting training programs for commercial and private pesticide applicators. Training programs are viewed as a principal mechanism that can be used to train applicators in ground-water concerns. Subsequently, label compliance and ground-water protection are integral components of these training courses. As such, the annual certification and re-certification workshops will serve as an appropriate forum to provide pesticide applicators with the training and education needed to comply with the requirements of pesticide application where use is governed by the SMP (i.e. areas demonstrating aquifer sensitivity/ground-water vulnerability).

Commercial applicators must be recertified every three years. Private applicators must be recertified every five years. Private applicator training is conducted as needed (usually once or twice a year) on a county by county basis. As the requirements of the SMP change, both the certification and recertification training programs will be revised, to include ground-water and pesticide information to the extent found necessary in that county. In the interim, certified

applicators will be notified in writing by the UW - CES of any operational changes due to changes in the SMP.

Supplemental Pesticide Labeling

A pesticide user must follow the instructions found on the product label. Therefore, the user must be provided with clear instructions on proper use of the pesticide. Under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), product labels contain legally enforceable usage directions. Aside from voluntary label changes by the manufacturer, product labels can be amended through Section 24 (c) of FIFRA which allows the modification of the federal label to meet local needs. The WDA Board of Certification, through Wyoming Statute (W.S.) §35-7-355 may, by promulgating rules or regulations, alter or suspend the use of any pesticide in Wyoming for cause. Supplemental labels approved by EPA during the registration review are provided with the containers prior to sale making the buyer subject to the changes.

To insure Wyoming pesticide users are provided with appropriate use information, label information updates will be requested from EPA as the requirements of the *Wyoming Generic State Management Plan for Pesticides in Ground Water* change.

Education

The cooperating state agencies (WDA, Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD), State Engineer's Office (SEO), UW - CES and the Spatial Data and Visualization Center (SDVC) and other entities will carry out a general educational effort to disseminate information provided in the SMP, and to provide a general awareness of the potential risk of ground-water contamination by pesticides. A plethora of information and education materials exist and will be utilized. In the event new information must be presented, the cooperating agencies will be responsible for development and dissemination of the information. Information dissemination will be conducted through the following mechanisms.

Wyoming Department of Agriculture

Dissemination of information contained in the SMP is the primary responsibility of the WDA and will be communicated to appropriate audiences through:

- WDA-sponsored public meetings;
- Releases through the news media;
- Mailings to certified pesticide applicators, registrants, dealers, and other affected and/or interested parties; and

- Utilization/contact with local conservation districts and agricultural organizations.

Information dissemination activities will be targeted at entities that traditionally utilize services offered by WDA, who are regulated by the agency, or who are impacted by ground-water contaminated by pesticides. However, the WDA is available to provide assistance to anyone having questions related to the SMP.

Wyoming Department of Environmental Quality/Water Quality Division

The Wyoming Department of Environmental Quality (WDEQ/WQD) will maintain copies of the SMP in each of the WDEQ's district offices. The WDEQ/WQD will provide SMP-related information and technical assistance to the public upon request.

University of Wyoming - Cooperative Extension Service

Pesticide users must have adequate information to identify vulnerable hydrogeologic environments in areas where pesticides of concern are being applied to determine if special prevention measures are required. The UW - CES provides both educational and technical assistance support to pesticide users in making these decisions.

The UW - CES will also:

- Work with the WDA and the WDEQ/WQD to develop informational and educational materials based on knowledge gained from ground-water quality protection demonstration projects;

- Train UW - CES staff in water quality issues, concerns, and Best Management Practices (BMPs) to better provide services at the local level;

- Assemble and distribute technical information generated by public agencies, industry, and universities which can lead to development and implementation of BMPs;

- Provide advice on pest control and individual pesticides, and provide Integrated Pest Management (IPM) services and advice; and

- Develop information on alternative pest management technologies.

Spatial Data and Visualization Center

The Spatial Data and Visualization Center (SDVC), in cooperation with the WDEQ/WQD, the WDA, and the UW - CES, will prepare final reports summarizing the findings of each aquifer sensitivity and ground-water vulnerability project on a county-by-county basis. Together, these agencies will conduct public meetings to present project results. The SDVC will make aquifer

sensitivity and ground-water vulnerability maps available to the public through city and county planning offices, local Conservation District offices, and the U.S. Department of Agriculture - Extension Service (USDA - ES) field offices. The maps will provide federal, state, and local governments, and landowners with a valuable decision-making tool to minimize the potential for ground-water contamination.

The SDVC also serves as a repository for ground-water quality data. Data is permanently stored on the STORET[2] data base at the SDVC's Laramie, Wyoming office, and is available to the public, upon request.

Various Outreach Efforts

Soil Conservation Districts

Local Soil Conservation Districts will provide educational materials to the public upon request.

Weed and Pest Districts

Wyoming's Weed and Pest Districts will:

- Work with the WDA and the WDEQ/WQD to develop informational and educational materials based on knowledge gained from ground-water quality protection demonstration projects;

- Assemble and distribute technical information generated by public agencies, industry, and universities which can lead to development and implementation of BMPs;

- Provide advice on pest control and individual pesticides, and provide IPM services and advice; and

- Develop information on alternative pest management technologies.

U.S. Department of Agriculture - Natural Resources Conservation Service

The U.S. Department of Agriculture - Natural Resources Conservation Service (NRCS) provides direct technical assistance to landowners in designing and carrying out plans for protecting

[2] STORET is the U.S. Environmental Protection Agency's water quality data base. It can be accessed from any number of sources, including EPA regional offices. This is important because citizens should have access to this information from more than one source and from sources compatible with their interest.

water quality. NRCS activities directly and/or indirectly support efforts to deal with pesticides in ground water. NRCS soil surveys provide detailed information on soils as well as information for assessing vulnerability of ground water to contamination from agricultural chemicals. NRCS can assist private land users in evaluating the pollution potential of various pesticides from surface runoff and deep leaching (Young, 1992). The Wyoming NRCS will assist in the implementation of the SMP by providing information dissemination to pesticide users (e.g., developing and implementing pesticide BMPs).

U.S. Department of Agriculture - Consolidated Farm Service Agency

The U.S. Department of Agriculture - Consolidated Farm Service Agency (CFSA) will assist in implementation of the SMP by providing technical assistance to pesticide users through information dissemination. Controlling pollution from nonpoint sources is currently recognized as one of the primary purposes of CFSA. The CFSA is working with the NRCS and the EPA to develop quantifiable data that can be collected to provide a better tool for monitoring and evaluating efforts to control nonpoint sources. The CFSA also uses data from the Rural Clean Water Program, including several projects with ground-water quality components, to aid in evaluating the effectiveness of BMPs (EPA, 1992b).

Registrants

Registrants assist pesticide users in the proper, environmentally sound application of their products. Registrants will assume a greater commitment to "product stewardship" by informing and training distributors and applicators on how their products should be managed to prevent degradation of ground-water quality.

Registrants may also:

- Provide a listing of registrant-produced educational materials and comment on how the materials can be disseminated to the appropriate audience;

- Interface and provide support to grower groups, universities, private consultants, etc., on SMP administration and enhancement;

- Produce informational brochures explaining the SMP to dealers, custom applicators, and certified applicators; and

- Provide training to registrant personnel (e.g., sales and distribution personnel) and enhance their ability to serve as information resources.

Pesticide Dealers

Pesticide dealers are in a unique position to provide one-on-one assistance to growers and users. The WDA will provide all pesticide dealers with a copy of the SMP and encourage dealers to educate their patrons.

Commodity Groups/Trade Organizations

The WDA encourages commodity and trade organizations to take the initiative in educating their members on the requirements of the SMP. The WDA will work with these organizations and tailor recertification meetings to specific crop/use concerns.

RECORDS AND REPORTING

Introduction

Documentation of the *Wyoming Generic State Management Plan for Pesticides and Ground Water* (SMP) and pesticide-specific SMPs not only provides a source of data to share with the U.S. Environmental Protection Agency (EPA) and other federal, state, and local agencies, but also provides a basis with which to assess the implementation and effectiveness of Wyoming's prevention and response measures.

Reporting Requirements - Generic Pesticide State Management Plan

The Wyoming Department of Agriculture (WDA) is required to report to the EPA on the development of the generic pesticide SMP under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) ground-water grant program.

Reporting Requirements - Pesticide-specific State Management Plan

The Biennial Report

WDA will be required to submit Biennial Reports to EPA for any pesticide-specific SMPs that may be required in the future.

If a Pesticide-specific SMP is required, the WDA will maintain all records relating to implementation for a period of at least four years. Records will include, but are not limited to:

- Ground-water monitoring and/or sampling records;
- Analytical results;
- Permits issued;
- Types and numbers of enforcement actions taken;
- Records of any site-specific regulatory actions; and
- Administrative actions.

The WDA will make available to the EPA, upon request, all records related to the development or implementation of the pesticide-specific SMP.

The WDA will develop and submit to the EPA - Region 8 a pesticide-specific SMP Biennial Report every two years. The Biennial Report will provide a basis for measuring Wyoming's progress toward protection of ground-water resources from pesticide contamination.

The Biennial Report will provide a basis for measuring Wyoming's progress toward protection of ground-water resources from pesticide contamination. More specifically, the report will 1) provide an assessment of the status of implementation efforts, 2) provide an assessment of the environmental effectiveness and the level of ground-water protection provided by the implemented pesticide-specific SMP, and 3) provide information to be used to help insure national consistency of protection. The EPA will use the information provided in the WDA's Biennial Report in their own budget process, to indicate national or regional trends.

The Administrators of the WDA, Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD), Wyoming State Engineer's Office (SEO), UW Cooperative Extension Service (UW - CES), and the Spatial Data and Visualization Center (SDVC) will reach concurrence on all reports prior to their submittal to the EPA.

The EPA may request additional reporting from the WDA on 1) programmatic activities, and 2) how pesticide-specific SMP grants are being used, as part of normal programmatic evaluations.

The pesticide-specific SMP Biennial Report will comprise two components: 1) a programmatic evaluation and 2) an environmental evaluation.

Programmatic Component

The programmatic component will describe whether and how the WDA is implementing all components of the pesticide-specific SMP. This component of the report will include:

- A demonstration that all twelve components of the pesticide-specific SMP are fully operational to protect ground water, and a discussion of the accomplishments and progress of each of the twelve components;

- Identification of any special issues (e.g., change in resources to implement the pesticide-specific SMP, change in legal authority, etc.) within Wyoming regarding the pesticide-specific SMP;

- A description of projected available resources for the next two years, with a comparison to the resources necessary to carry out the pesticide-specific SMP;

- A description of proposed modifications or updates to the pesticide-specific SMP (these can be submitted at other times as well);

- Data on the number of inspections performed to determine compliance with provisions of the pesticide-specific SMP, completed enforcement actions related to noncompliance, and a summary of findings; and

- A description of response actions taken for detections of specific pesticides.

Environmental Component

The EPA will use the environmental component of the Biennial Report to determine if pesticide-specific SMPs are successfully protecting ground water from pesticide contamination. The EPA recognizes that direct measurement of environmental benefit may not be obtainable over the first few years of pesticide-specific SMP implementation. However, over time and through evaluation of ground-water monitoring results, pesticide usage, and perhaps additional or other environmental indicators, the EPA expects to draw conclusions on the effectiveness of pesticide-specific SMPs. The environmental component of the Biennial Report will include:

- The results and analyses from ground-water monitoring and sampling, and a summary of significant finds which will prompt the WDA to increase its degree of oversight of use of the pesticide or modify the pesticide-specific SMP; and

- An assessment of pesticide usage and whether use of the specific pesticide has increased, decreased, or remained essentially the same over the past two years.

Reporting of Significant Finds

The WDA will report any significant findings to the EPA - Region 8 Pesticide Program. Significant finds include, but are not limited to, those that prompt the WDA to increase its degree of oversight of use of the pesticide, or modify the pesticide-specific SMP (e.g., actual or anticipated exceedences of Wyoming Ground-water Quality Standards, widespread contamination, etc.).

It will not be necessary to report a detection of a pesticide in a ground-water sample until the subsequent investigation has been completed and a determination of significance has been made.

The cooperating state agencies responsible for development and implementation of the SMP (WDA, WDEQ/WQD, SEO, UW - CES and SDVC) will be party to all reports submitted to the EPA.

Final or Interim Reporting

The WDA will submit a final or interim report of monitoring data to the EPA Headquarters' Pesticides in Ground-water Database concurrent with the Biennial Evaluation.

REFERENCES

Adler, Robert, W., 1992. "Returning to the Goals of the Clean Water Act", Waste Management Research Report, Vol. 4, No. 2.

Bigelow, Jim, 1993. Wyoming Department of Agriculture, personal communication and correspondence.

Bigelow, Jim, 1992. Wyoming Department of Agriculture, personal communication.

Boyce, Kevin, 1993. Wyoming State Engineer's Office, personal communication and correspondence.

Boyce, Kevin, 1992. Wyoming State Engineer's Office, personal communication.

Brown, Randy, 1993. U.S. Environmental Protection Agency - Region VIII, personal communication and correspondence.

Brown, Randy, 1992. U.S. Environmental Protection Agency - Region VIII, personal communication and correspondence.

Bureau of National Affairs, Inc., 1993. Environment Reporter (9/3/93).

Burkhardt, Chris C., 1991. Insect Pests of Field Crops. University of Wyoming, Laramie, January, 1991.

Classen, Carl, 1993. Wyoming Association of Municipalities, personal communication and correspondence.

Congressional Research Service, the Library of Congress, 1991. CRS Report for Congress, of Environmental Laws Administered by the Environmental Protection Agency, Environment and Natural Resources Division, March 14, 1991.

Dutra, Jack, 1994. Dow Elanco, personal communication and correspondence.

ENSR Corporation, 1989. "Superfund Guidebook, A Guide to Managing Responses to Toxic Releases Under Superfund", Third Edition, September 1989.

EPA, 1994a. Office of Prevention, Pesticides, and Toxic Substances, Appendix B: Assessment, Prevention, Monitoring, and Response Components of State Management Plans, February 1994.

EPA, 1994b. Consolidated Rule Summary for the Chemical Phases, Office of Water, 4601, EPA 812-S-94-001, April 1994.

EPA, 1993a. Guidance for Pesticides and Ground Water State Management Plans, Office of Prevention, Pesticides, and Toxic Substances, EPA 735-B-93-005a, December 1993.

EPA, 1993b. Office of Ground-water Protection/Office of Water, a Review of Methods for Assessing Aquifer Sensitivity and Ground-water Vulnerability to Pesticide Contamination, EPA 813-R-93-002.

EPA - Region VIII, 1992a. Personal communication and correspondence with Ed Stearns and Randy Brown.

EPA, Office of Pesticides Programs, 1992b. Appendix B: Assessment, Prevention, Monitoring, and Response Components of Pesticides State Management Plans, Review Draft, July 1992.

EPA, 1992c. Prevention Pesticides and Toxic Substances (H7507C). Pesticides in Ground Water Database; A Compilation of Monitoring Studies: 1971-1991, Region 8, EPA 734-12-92-001, August 1992.

EPA, 1992d. Office of Solid Waste, RCRA Ground-water Monitoring: Draft Technical Guidance, November 1992.

EPA, 1991a. Office of Research and Development, Handbook of Suggested Practices for the Design and Installation of Ground-water Monitoring Wells, EPA/600/4-89/034, March 1991.

EPA, 1991b. Pesticides and Toxic Substances, Pesticides and Ground-water Strategy, October 1991.

EPA, 1991c. "Pesticides and Ground-water Strategy", 21T-1022, October 1991.

EPA, Offices of Water and Pesticides and Toxic Substances, 1990. National Pesticide Survey Glossary.

EPA, 1989. Office of Ground-water Protection/Office of Water, EPA Order 7500.1 - Minimum Set of Data Elements for Ground Water, September 11, 1989.

EPA, 1986. Office of Waste Programs Enforcement/Office of Solid Waste and Emergency Response, RCRA Ground-water Monitoring Technical Enforcement Guidance Document, September 1986.

EPA, Office of Solid Waste and Emergency Response, 1983. "Superfund's Remedial Response Program", HW-4, Revised Edition, 1983.

Ferrell, Mark, 1993. University of Wyoming Cooperative Extension Service, personal communication and correspondence.

Ferrell, Mark A., 1991. Basic Guide to Weeds and Herbicides. University of Wyoming, Laramie, January, 1991.

Feusner, Leroy C., 1990. Wyoming Oil and Hazardous Substances Pollution Contingency Plan. Wyoming Department of Environmental Quality, Cheyenne, Revised June, 1990.

Florida Department of Environmental Regulation, 1993. Ground-water Quality Monitoring Network.

Frederick, Kevin, 1996. Wyoming Department of Environmental Quality/Water Quality Division, personal communication.

Frederick, Kevin, 1993. Wyoming Department of Environmental Quality/Water Quality Division, personal communication and correspondence.

Frederick, Kevin, 1992. Wyoming Department of Environmental Quality/Water Quality Division, personal communication.

Gale, Alvin F., 1979. Introduction to Pesticides, MP17. University of Wyoming, Laramie, June, 1979.

Gloss, Steve, 1993. Wyoming Water Resources Center, personal communication and correspondence.

Hallwachs, Bobbie, 1993. Wyoming Association of Conservation Districts, personal communication and correspondence.

Hittle, George, 1991. Water-Quality Monitoring Network Report, Herbicide Monitoring Program; 1990 Water Quality Analysis, Wyoming Department of Agriculture/U.S. Geological Survey Information, March 1, 1991.

Larson, John, 1991. Personal Communication. USDA Animal and Plant Health Inspection Service, Cheyenne, Wyoming. February, 1991.

Lawson, Fred A. and Everett Spackman, 1981. Pests and Stored Grains, MP22. University of Wyoming, Laramie, January, 1981.

McNamee, Michael A., 1978. Pesticide Application Equipment. Calibration and Maintenance, MP26. University of Wyoming, Laramie, October, 1978.

Michie, Jerry, 1993. Wyoming County Commissioners Association, personal communication and correspondence.

National Vocational Agricultural Teachers Association, 1992. A Hidden Treasure, Instructional Materials for Ground-water Resource Protection.

Needham, 1993. Wyoming Water Resources Center Newsletter, 1993.

Ritz, George, 1993. U.S. Geological Survey, personal communication and correspondence.

Ross, William D., and George H. Bridgmon, 1991. Plant Disease Control. University of Wyoming, Laramie, January, 1991.

Safe Drinking Water Hotline (1-800-426-4791), 1994. Information on public water supply programs, policy, technical and regulatory items.

Schmidt, David, 1996. Written correspondence from David Schmidt, Environmental Scientist, U.S. EPA - Region VIII; June 25, 1996.

Stearns, Edward, 1993. Written communication with Edward Stearns, Pesticide Specialist, U.S. Environmental Protection Agency - Region VIII, January 22, 1993.

Stearns, Ed, 1992. U.S. Environmental Protection Agency - Region VIII, personal communication and correspondence.

Strohman, Jake, 1993. Wyoming Department of Environmental Quality/Water Quality Division, personal communication and correspondence.

Strohman, Jake, 1992. Wyoming Department of Environmental Quality/Water Quality Division, personal communication.

Swanson, R. Lawrence, 1992. "Clean Water Act Needs Emphasis on Prevention", Waste Management Research Report, Vol. 4, No. 2.

USDA - Natural Resources Conservation Service, 1990. Water Quality Impairment Analysis. Casper, Wyoming, November, 1990.

Utah Department of Agriculture, 1989. Draft: September 1989 Ground-water Protection Strategy for Pesticides and Agricultural Chemicals, Appendix C, Factors Affecting Pesticide Leaching.

Whitson, Tom D., M.A. Ferrell, and S.D. Miller, 1989. Herbicides and Their Properties and Applications. Wyoming Weed Control Series, No. 1. University of Wyoming, Laramie, April, 1989.

Whitson, Tom D., and S.D. Miller, 1989. Weed Control in Alfalfa. Wyoming Weed Control Series, No. 2. University of Wyoming, Laramie, April, 1989.

Whitson, Tom D., and S.D. Miller, 1989. Weed Control in Cereal Grain Crops. Wyoming Weed Control Series, No. 3. University of Wyoming, Laramie, April, 1989.

Whitson, Tom D., and S.D. Miller, 1989. Weed Control in the Conservation Reserve Program and Newly Established Grasses. Wyoming Weed Control Series, No. 4. University of Wyoming, Laramie, April, 1989.

Whitson, Tom D., and S.D. Miller, 1989. Weed Control in Corn. Wyoming Weed Control Series, No. 5. University of Wyoming, Laramie, April, 1989.

Whitson, Tom D., and S.D. Miller, 1989. Weed Control in Dry Beans. Wyoming Weed Control Series, No. 6. University of Wyoming, Laramie, April, 1989.

Whitson, Tom D., and S.D. Miller, 1989. Weed Control in Potatoes. Wyoming Weed Control Series, No. 7. University of Wyoming, Laramie, April, 1989.

Whitson, Tom D., and S.D. Miller, 1989. Weed Control in Sugar Beets. Wyoming Weed Control Series, No. 8. University of Wyoming, Laramie, April, 1989.

Whitson, Tom D., and M.A. Ferrell, 1989. Weed Control in Pastures and Rangeland. Wyoming Weed Control Series, No. 9. University of Wyoming, Laramie, April, 1989.

Whitson, Tom D., and R.D. Comes, and R. Parker, 1989. Aquatic Weed Control. Wyoming Weed Control Series No. 10. University of Wyoming Cooperative Extension Service, Laramie, April, 1989.

Whitson, Tom D. 1989. Weed Control on Rights-of-Way and Non-Cropland. Wyoming Weed Control Series No. 11. University of Wyoming Cooperative Extension Service, Laramie, April, 1989.

Wiemhoff, John, 1992. "TSCA: The Bump Under the Carpet" in The National Environmental Journal, July/August 1992.

Wyoming Department of Agriculture, 1994. "Applicator Certification Rules and Regulations", Chapter 28, April, 1994.

Wyoming Department of Environmental Quality/Water Quality Division, 1993 Rules and Regulations, Chapter VIII, “Quality Standards for Wyoming Groundwaters”, March 12, 1993.

Wyoming Department of Environmental Quality, 1990. Water Quality Division Rules and Regulations, Chapter I, "Quality Standards for Wyoming Surface Waters", November 29, 1990.

Wyoming Department of Environmental Quality, 1984. Water Quality Division Rules and Regulations, Chapter IV, "Regulations for Releases of Oil and Hazardous Substances into Waters of the State of Wyoming", October 1, 1984.

Wyoming Department of Environmental Quality, 1980. Water Quality Division Rules and Regulations, Chapter IX, "Wyoming Ground-water Pollution Control Permit", September 4, 1980.

Wyoming Environmental Pesticide Control Act of 1973, Sections 35-7-350 through 35-7-374.

Wyoming Ground-water Protection Committee, 1991. Suggestions for BMPs for the Ground-water Task Force, 1991. Unpublished.

Wyoming Nonpoint Source Management Plan, Draft, 1989. Prepared by the Wyoming Department of Environmental Quality/Water Quality Division.

Young, Lon, 1992. U.S. Department of Agriculture - Natural Resources Conservation Service, personal communication and correspondence.

GLOSSARY

Analytes: Chemicals tested for in an analysis (EPA, 1994a).

Aquifer: Means a zone, stratum or group of strata that can store and transmit water in sufficient quantities for a specific use (Wyoming Department of Environmental Quality/Water Quality Division Rules and Regulations, Chapter VIII, "Quality Standards for Wyoming Groundwaters").

Aquifer Sensitivity: The intrinsic susceptibility of an aquifer to pesticide contamination. Sensitivity is related solely to the hydrogeologic characteristics of the aquifer and the overlying geologic materials. Sensitivities unrelated to agricultural practices, the degree of pesticide toxicity, and the nature of exposure, if any, to human or other populations (EPA, 1994a).

Aquifer Vulnerability: Susceptibility of an aquifer to contamination resulting from the combined effects of intrinsic sensitivity of the aquifer and the agricultural practices used (EPA, 1994a).

Baseline Monitoring: Involves the measurement of ground-water quality and its deviations in relation to established standards (EPA, 1994a).

Best Management Practice (BMP): A practice or combination of practices that, after problem assessment, examination of alternative practices and appropriate public participation, are determined to be the most technologically and economically feasible means of preventing or reducing nonpoint source pollution, and which provide a reasonable financial return to the landowner for the investment while attaining instream water quality standards. BMPs are adopted through the Wyoming Continuing Planning Process after problem assessment, examination of alternative practices, and appropriate public participation (Wyoming Department of Environmental Quality/Water Quality Division Rules and Regulations, Chapter I, "Quality Standards for Wyoming Surface Waters").

Biodegradation: Chemical degradation brought about by living organisms (EPA, 1994a).

Certified Applicator: Any individual who is certified by the Commissioner of the Wyoming Department of Agriculture as being competent with respect to the use and handling of pesticides, or of the use and handling of the pesticide or class of pesticides covered by the individual's certification (Wyoming Environmental Pesticide Control Act of 1973, §35-7-354(a)(i)).

Chemigation: The practice of mixing pesticides or fertilizers with irrigation water and applying the mixture to cropped fields (EPA, 1994a).

Commercial Applicator: A certified applicator (whether or not he is a private applicator with respect to some uses) who uses or supervises the use of any pesticide which is classified for restricted use for any purpose or on any property other than as provided under the definition of "private applicator" (Wyoming Environmental Pesticide Control Act of 1973, §35-7-354(a)(ii)).

Contaminant: Any physical, chemical, biological, or radiological substance or matter that has an adverse effect on air, water, or soil (EPA, 1994a).

Contamination: The direct or indirect introduction of any contaminant into ground water caused in whole or in part by human activities (EPA, 1990).

Degradate: The product of the chemical or biological breakdown of a complex compound into simpler compounds (EPA, 1990).

Degradation: The breakdown of a pesticide into reaction products, generally of less complex form (EPA, 1994a).

Detection: The discovery of the presence of a ground-water constituent during monitoring for indicator parameters, specific pesticides, or pesticide reaction products (EPA, 1994).

Detection Limits: Concentration values below which the instrument is unable to measure presence of the analyte (EPA, 1994a).

DRASTIC: A classification system that attempts to provide a relative ranking of the vulnerability of ground water to contamination. The letters in DRASTIC stand for features of the area around the well that may affect the movement of pesticides into ground water: (depth to water, recharge, aquifer media, soil media, topography, impact of the unsaturated aqueous zone between the soil media and water table, and conductivity of the aquifer). DRASTIC does not consider sources of the contamination or population affected (EPA, 1990).

Environment: Means water, air, land and all plants, man or other animals living therein, and the relationships which exists among them (Wyoming Applicator Certification Rules and Regulations, Chapter 28, Section 2(l)).

Evaluation Monitoring: Observation and testing of ground-water quality to determine the effectiveness of a State Management Plan in preventing ground-water contamination (EPA, 1994a).

Federal Insecticide, Fungicide, and Rodenticide Act: Federal law first enacted in 1947 and administered by the EPA since 1970. Under FIFRA, EPA registers pesticide products and insures they will not present unreasonable risks to human health or the environment when used according to label directions (EPA, 1990).

General Use Pesticide: Means any pesticide formulation not classified as restricted use (Wyoming Applicator Certification Rules and Regulations, Chapter 28, Section 2(o)).

Geographic Information Systems (GIS): GIS provides a computer-based method of storing, retrieving, analyzing, and displaying geographic and nongeographic data. A GIS is comprised of hardware and software that allows the use of data layering from a variety of existing sources including aerial photographs, topographic maps, land use and zoning maps, satellite images, and field notes. For example, a GIS can store the locations of specific pesticide application areas and vulnerable ground-water sources and use this data to identify their geographic locations on a map. GIS can also perform database management functions. Because data about a geographic area may change with time (e.g., pesticide use, agricultural practices, and water use), data layers may require frequent updating. GIS allows data already existing in the system to be updated (i.e., modified or deleted) as conditions change (EPA, 1994a).

Ground Water: Means subsurface water that fills available openings in rock or soil materials such that they may be considered water saturated under hydrostatic pressure (Wyoming Department of Environmental Quality/Water Quality Division Rules and Regulations, Chapter VIII, "Quality Standards for Wyoming Groundwaters").

Ground Waters of the State: Are all bodies of underground water which are wholly or partially within the boundaries of the State; ground waters of the state is synonymous with ground waters of Wyoming (Wyoming Department of Environmental Quality/Water Quality Division Rules and Regulations, Chapter VIII, "Quality Standards for Wyoming Groundwaters").

Hazard: Means a probability that a given pesticide will have an adverse effect on man or the environment in a given situation, the relative likelihood of danger or ill effect being dependent on a number of interrelated factors present at any given time (Wyoming Applicator Certification Rules and Regulations, Chapter 28, Section 2(p)).

Hazardous Substance: Any substance or waste which, after release, constitutes a threat to public health or welfare, or other aquatic life or wildlife because of its quantity, concentration, chemical, corrosive, flammable, reactive, toxic, infectious, or radioactive characteristics. The term shall also include all substances so designated by the U.S. EPA. The term shall not include oil (Wyoming Department of Environmental Quality/Water Quality Division Rules and Regulations, Chapter IV, Regulations for Releases of Oil and Hazardous Substances into Waters of the State of Wyoming).

Health Advisory Level (HAL): The maximum concentration of a contaminant in water that may safely be consumed over a specific time period. EPA sets HALs for short-term exposures, such as one day and ten days, and longer-term exposures of greater than ten days up to several years, and over a lifetime. A pesticide's HAL is based on health effects (other than cancer) that were found in humans or in animals given high doses of

the pesticide in laboratory studies. For pesticides believed to cause cancer, EPA does not calculate a lifetime HAL. Instead, EPA calculates the increased risks of cancer that are associated with different concentrations and exposures to the pesticide (EPA, 1990).

Herbicide: A pesticide used to limit or inhibit plant growth (EPA, 1990).

Human Health Risk: The probability that a given exposure or series of exposures will damage the health of individuals experiencing the exposures (EPA, 1990).

Hydraulic Conductivity: The rate of flow of water in gallons per day through a cross section of one square foot under a unit hydraulic gradient, at the prevailing temperature (gpd/ft^2). In the SI System, the units are $m^3/day/m^2$ or m/day (EPA, 1994a).

Hydraulic Gradient: The rate of change in energy contained in a water mass that is produced by elevation, pressure, or velocity, or per unit of distance of flow in a given direction (EPA, 1994a).

Hydrogeologic: Refers to the interrelationships of geologic materials and processes with water, especially ground water (EPA, 1994a).

Insecticide: A pesticide used to control insects (EPA, 1990).

Integrated Pest Management: A pest population management system that anticipates and prevents pests from reaching damaging levels by using techniques such as natural enemies, pest-resistant plants, cultural management, and judicious use of pesticides. A mixture of pesticide and non-pesticide methods to control pests. IPM reduces total pesticide use while economically controlling pest reduction efforts and maintaining the economic yield of the protected crop(s) (EPA, 1994a).

Label: Means the written, printed or graphic matter on, or attached to, the pesticide or device or any of its containers or wrappers (Wyoming Applicator Certification Rules and Regulations, Chapter 28, Section 2(r)).

Leachability: The ability of a pesticide to percolate downward from the top soil layer (EPA, 1994a).

Leaching: The process by which soluble constituents are dissolved and carried down through the soil by a percolating fluid (EPA, 1994a).

Licensed Pesticide Dealer: Means any person who makes available for use any restricted use pesticide, or who offers to make available for use any restricted use pesticide (Wyoming Applicator Certification Rules and Regulations, Chapter 28, Section 2(u)).

Maximum Contaminant Level (MCL): The maximum permissible level of a contaminant in water which is delivered to any user of a public water system (established by the Safe Drinking Water Act (SDWA)), (EPA, 1990).

Misuse: Use of a pesticide in a manner inconsistent with its label.

Monitor: Means obtain fluid samples for analysis and/or water level measurements, or observe and record (Wyoming Department of Environmental Quality/Water Quality Division Rules and Regulations, Chapter IX, "Wyoming Ground-water Pollution Control Permit").

Nitrate: A compound containing nitrogen which can exist in the atmosphere or as a dissolved gas in water and which can have harmful effects on humans and animals. Nitrates in water can cause severe illness in infants and cows (EPA, 1994a).

Nonpoint Source: Means any source of pollution other than a point source (Wyoming Environmental Quality Act, 1992, Section 35-11-103 (a)(x)).

Nonpoint Source Pollution: Contamination (of ground water) originating from a wide area, not from well defined locations, a mobile or dispersed source of pollutants. Examples: acid rain deposition and contamination of surface water by salting roads, automobiles (EPA, 1994a).

Parameter: Means one of a set of physical or chemical properties whose measured values determine the characteristics of a fluid (Wyoming Department of Environmental Quality/Water Quality Division Rules and Regulations, Chapter VIII, "Quality Standards for Wyoming Ground Waters").

Pest: Means any insect, snail, slug, rodent, predator, nematode, fungi, weed, or other form of terrestrial or aquatic plant, or animal life, or virus, bacteria, or other micro-organisms (except viruses, bacteria, or other micro-organisms in or on living man or other living animals) which the Board of Certification declares to be a pest (Wyoming Applicator Certification Rules and Regulations, Chapter 28, Section 2(aa)).

Pesticide:

(i) Any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pests;

(ii) Any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant; and

(iii) Any substance or mixture of substances intended to be used as a spray adjuvant (Wyoming Environmental Pesticide Control Act of 1973, §35-7-354(d)(i), (ii), and (iii).

Pesticide Degradate: A generic term that includes breakdown products of a pesticide active ingredient resulting from biological processes (i.e. metabolites) and chemical processes (i.e., hydrolysis, photolysis, photo-oxidation) (EPA, 1990).

Pesticide Metabolite: A product of biological processes (e.g., metabolism, or the chemical changes in living cells) of a pesticide active ingredient by microorganisms, plants, or animals (EPA, 1990).

Permeability: Water infiltration rate (the rate at which liquids pass through soil or other materials in a specified direction (EPA, 1994a).

pH: Measure of the acidity or alkalinity of a solution (EPA, 1994a).

Phreatic: In the zone of saturation (EPA, 1994a).

Piezometer: Basic field device for measurement of hydraulic head (energy contained in a water mass, produced by elevation, pressure, or velocity), a tube or pipe in which the elevation of a water level can be determined. Piezometers are usually installed in groups so that they can be used to determine the direction of ground-water flow (EPA, 1994a).

Point Source: Means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation or vessel or other floating craft, from which pollutants are or may be discharged (Wyoming Environmental Quality Act, 1992, Section 35-11-103 (a)(xi)).

Pollution: Means contamination or other alteration of the physical, chemical or biological properties of any waters of the state, including change in temperature, taste, color, turbidity or odor of the waters or any discharge of any acid or toxic material, chemical or chemical compound, whether it be liquid, gaseous, solid, radioactive or other substance, including wastes, into any waters of the state which creates a nuisance or renders any waters harmful, detrimental or injurious to public health, safety or welfare, to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wildlife or aquatic life, or which degrades the water for its intended use, or adversely affects the environment. This term does not mean water, gas, or other material which is injected into a well to facilitate production of oil, or gas in a well, if the well used either to facilitate production or for disposal purposes is approved by authority of the state, and if the state determines that such injection or disposal well will not result in the degradation of ground or surface or water resources (Wyoming Environmental Quality Act, 1992, Section 35-11-103 (c)(i)).

Prevention: Measures taken to control application or release of chemicals so as to minimize the chance of potential harmful effects to humans or the environment through contamination of a resource, such as ground water or surface water.

Private applicator: Any certified applicator who uses or supervises the use of any restricted use pesticide which is restricted to use by certified applicators and only for purposes of producing any agricultural commodity on property owned by him or his employer or under his control or is applied without compensation other than trading of personal services between producers of agricultural commodities on the property of another person (Wyoming Environmental Pesticide Control Act of 1973, §35-7-354(a)(iii)).

Quality Assurance/Quality Control (QA/QC): QA functions are management tools that are independent of technical organization. QC functions are the integral activities within technical support projects that are designed to assure or control data precision and accuracy (EPA, 1994a).

Release: Includes, but is not limited to, any sudden spilling, leaking, pumping, pouring, emptying, emitting, discharging, dumping, addition of, escaping, leaching, or unauthorized disposal of any oil or hazardous substance which enters, or threatens to enter, waters of the state (Wyoming Department of Environmental Quality/Water Quality Division Rules and Regulations, Chapter IV, " Regulations for Releases of Oil and Hazardous Substances into Waters of the State of Wyoming").

Remediation: The process of reducing the harmful effects of contamination incidents (EPA, 1994a).

Response: Actions initiated after a pesticide is detected in ground water (EPA, 1994a).

Responsible Party: A person who, except when authorized by a permit issued pursuant to the provisions of the Wyoming Environmental Quality Act, shall:

(i) cause, threaten, or allow the discharge of any pollution or wastes into the waters of the state,

(ii) alter the physical, chemical, radiological, biological, or bacteriological properties of any waters of the state (Wyoming Environmental Quality Act, §35-11-301).

Restricted Use Pesticide: Any pesticide product, the label of which states "restricted use" as required for registration by the Environmental Protection Agency under the federal Insecticide, Fungicide and Rodenticide Act of 1972, as amended (Wyoming Applicator Certification Rules and Regulations, Chapter 28, Section 2(e)).

Rodenticide: An agent (chemical) that kills, repels, or controls rodents (EPA, 1994a).

Safe Drinking Water Act (SDWA): A law passed in 1974 and administered by EPA that establishes national standards for drinking water to provide a safe and wholesome water supply from both surface and ground-water sources (EPA, 1990).

Seep: A spot where a fluid (e.g., water, oil, or gas) contained in the ground oozes slowly to the surface and often forms a pool (EPA, 1994a).

Silviculture: Tree farming (EPA, 1994a).

Spring: A source of water issuing from the ground (EPA, 1994a).

Surface Waters of the State: All permanent and intermittent defined drainages and lakes, reservoirs, and wetlands which are not man-made retention ponds used for the treatment of municipal, agricultural or industrial waste; and all other bodies of surface water, either public or private which are wholly or partially within the boundaries of the State. Nothing in this definition is intended to expand the scope of the Environmental Quality Act, as limited in W.S. §35-11-1104 (Wyoming Department of Environmental Quality/Water Quality Division Rules and Regulations, Chapter I, "Quality Standards for Wyoming Surface Waters").

Topography: The physical features of a surface area including relative elevations and the position of natural and man-made features (EPA, 1994a).

Unsaturated Zone: The underground area below the soil layers but above the vadose zone and the water table in which water does not fill the available spaces (EPA, 1994a).

Vadose Zone: Means the unsaturated zone in the earth, between the land surface and the top of the first saturated aquifer which is not a perched water aquifer. The vadose zone characteristically contains liquid water under less than atmospheric pressure, and water vapor and air or other gases at atmospheric pressure. Perched water bodies exist within the vadose zone (Wyoming Department of Environmental Quality/Water Quality Division Rules and Regulations, Chapter VIII, "Quality Standards for Wyoming Ground Waters").

Waters of the State: Means all surface and ground water, including waters associated with wetlands, within Wyoming (Wyoming Environmental Quality Act, 1992, Section 35-11-103 (c)(vi)).

Water Table: The level of ground water (EPA, 1994a).

Well: A bored, drilled, or driven shaft, or a dug hole, whose depth is greater that the largest surface dimension and whose purpose to reach underground water supplies or oil, or to store or bury fluids below ground (EPA, 1994a).

Wellhead: The land surface and subsurface area surrounding a water supply well (EPA, 1994a).

Well Casing: A solid piece of pipe, typically steel or PVC plastic, used to keep a well open in either unconsolidated materials or unstable rock (EPA, 1994a).

Well Seal: Low-permeability material that is emplaced to fill the annular space around a well (EPA, 1994a).

ACRONYMS

ACP:	Agriculture Conservation Program
APHIS:	U.S. Department of Agriculture - Animal Plant Health Inspection Service
ARS:	Agricultural Research Service
BAT:	Best Available Technology
BLM:	U.S. Department of the Interior - Bureau of Land Management
BMP:	Best Management Practice
CERCLA:	Comprehensive Environmental Response, Compensation, and Liability Act
CES:	U.S. Department of Agriculture - Cooperative Extension Service
CFR:	Code of Federal Regulations
CFSA:	U.S. Department of Agriculture - Consolidated Farm Service Agency
CRM:	Coordinated Resource Management
CRS:	Congressional Research Service
CSGWPP:	Comprehensive State Ground Water Protection Program
CWA:	Clean Water Act
DOA:	United States Department of Agriculture
DRASTIC:	Depth to water, Recharge, Aquifer media, Soil media, Topography, Impact of the unsaturated aqueous zone between the soil media and water table, and Conductivity of the aquifer
EPA:	U.S. Environmental Protection Agency
FIFRA:	Federal Insecticide, Fungicide, and Rodenticide Act
FIPS:	Federal Information Procedures System
GC/MS:	Gas Chromatography/Mass Spectroscopy

GIS:	Geographic Information Systems
GPSC:	Ground-water and Pesticides Strategy Committee
HAL:	Health Advisory Level
IPM:	Integrated Pest Management
ICM:	Integrated Crop Management
MCL:	Maximum Contaminant Level
MOA:	Memoranda of Agreement
MOU:	Memoranda of Understanding
MSDE:	Minimum Set of Data Elements
MSDS:	Material Safety Data Sheet
NACA:	National Association of Chemical Applicators
NOI:	Notice of Intent
NPDES:	National Pollution Discharge Elimination System
NPS:	Nonpoint Source
NRCS:	U.S. Department of Agriculture - Natural Resources Conservation Service
NWQL:	National Water Quality Laboratory
PL:	Public Law
PMO:	Pasteurized Milk Ordinance
PMZ:	Pesticide Management Zone
ppm:	parts per million (approximately equivalent to milligrams per Liter)
ppb:	parts per billion (approximately equivalent to micrograms per Liter)
PWS:	Public Water System

QAPP:	Quality Assurance Procedures Plan
QA/QC:	Quality Assurance/Quality Control
RCRA:	Resource Conservation and Recovery Act
SDWA:	Safe Drinking Water Act
SEO:	Wyoming State Engineer's Office
SMP:	State Management Plan
SOP:	Standard Operating Procedure
STORET:	Storage and Retrieval of U.S. Waterways Parametric Data System
SDWIS:	Safe Drinking Water Information System
TAD:	Technical Assistance Document
TEGD:	Technical Enforcement Guidance Document
TSCA:	Toxic Substances Control Act
USC:	United States Code
USDA - ES:	U.S. Department of Agriculture - Extension Service
USFS:	United States Forest Service
USGS:	U.S. Geological Survey
UST:	Underground Storage Tank
UW - CES:	University of Wyoming - Cooperative Extension Service
WACD:	Wyoming Association of Conservation Districts
WDA:	Wyoming Department of Agriculture
WDEQ/SHWD:	Wyoming Department of Environmental Quality - Solid and Hazardous Waste Division
WDEQ/WQD:	Wyoming Department of Environmental Quality - Water Quality Division

WGS: Wyoming Geological Survey

WHPA: Wellhead Protection Area

W.S.: Wyoming Statute

WWQIA: Wyoming Water Quality Impairment Analysis

WWRC: Wyoming Water Resources Center

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APPENDIX C

PROCEDURE:

WDEQ/WQD's DETERMINATION OF GROUND-WATER QUALITY STANDARDS

1. Where the U.S. Environmental Protection Agency (EPA) has proposed or promulgated a **Maximum Contaminant Level (MCL)** for a specific pesticide pursuant to the Safe Drinking Water Act (SDWA), the MCL is used as the Wyoming ground-water quality standard for that pesticide. MCLs have been established for some, but not all, pesticides.

2. Where the EPA has not proposed or promulgated an MCL for a specific pesticide, the Administrator of the Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD) will determine the ground-water quality standard for that pesticide pursuant to Chapter VIII, Section 4 of the WDEQ/WQD Rules and Regulations. The formulas for determining ground-water quality standards for non-MCL pesticides are consistent with those described in WDEQ/WQD's "Procedures for Establishing Environmental Restoration Standards for Leaking Underground Storage Tank Remediation Actions" as follows:

   a. A **Drinking Water Equivalent Level (DWEL)** is calculated for the pesticide (carcinogenic and non-carcinogenic), using the formula:

$$DWEL = \frac{(RfD)(ABW)HQ)}{(DWI)(AB)(FOE)} \qquad (1)$$

      1) If the pesticide is a non-carcinogen (EPA Cancer Group D or E) the **DWEL** is the ground-water quality standard.

   b. If the pesticide is a known, probable, or possible carcinogen (EPA Cancer Group A, B or C) the following formula is also used:

$$DWEL = \frac{(RISK)(ABW)(LIFE)}{(CPF)(DWI)(AB)(FOE)(DUR)} \qquad (2)$$

      1) The ground-water quality standard for a known, probable or possible carcinogen is the **DWEL** calculated in formula (1) or (2), whichever is most protective (i.e., less).

DWEL = Drinking Water Equivalent Level, mg/1 (for non-carcinogens and carcinogens)
RISK = Cancer Risk Factor for drinking water; (1×10^{-6})
ABW = Average Body Weight over exposure period; (62 kg)
CPF = Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$; chemical specific
RfD = Oral Reference Dose (mg/kg-day); chemical specific
DWI = Drinking Water Intake; (2 L/day)
AB = Gastrointestinal Absorption Rate; (1.0)

LIFE = Lifetime (70 yrs.)
DUR = Duration of Exposure; (30 yrs.)
FOE = Frequency of Exposure; (350 days/365 days = 0.96)
HQ = Hazard Quotient; (1.0)

From the above formula(s), ground-water quality standards for some pesticides and degradation products managed under the Generic State Management Plan (SMP) have been established (Table C-1).

TABLE C-1
WYOMING GROUND-WATER QUALITY STANDARDS
FOR PESTICIDES

Common Name	Trade Name	WY Ground-Water Quality Standard* (mg/L)	Federal MCL** (mg/L)
Alachlor	Lasso		0.002
Aldicarb	Temik		0.007
Aldicarb Sulfone	(Aldicarb by-product)		0.007
Aldicarb Sulfoxide	(Aldicarb by-product)		0.007
Atrazine	AAtrex		0.003
Bromacil	Hyvar XL	@	@
Clopyralid	Stinger, Curtail	@	@
Cyanazine	Bladex	0.0009[2]	
2,4-D	(Known by many trade names)		0.07
DCPA	Dacthal	16.14[3]	
Dicamba	Banvel	0.969[3]	
Dichloropropene	Telone	0.01[4]	
Difenzoquat	Avenge	2.58	
Hexazinone	Velpar	1.065[3]	
Metolachlor	Dual	4.84[5]	
Metribuzin	Lexone, Sencor		0.200
Metsulfuron	Ally, Escort	@	@
Picloram	Tordon 22K		0.5
Simazine	Princep, Primatol Aquazine		0.004
Tebuthiuron	Spike	2.260[3]	

[1] **Sources:**
Drinking Water Regulations and Health Advisories; Office of Water, U.S. EPA, April,

1992.
Risk Assessment, Management and Communication of Drinking Water Contamination; Seminar Publication, Office of Water, U.S. EPA, June, 1990, EPA/625/4-89/024.

Risk-Based Concentration Table; Region III, U.S. EPA, October, 1993.

Procedures for Establishing Environmental Restoration Standards for Leaking Underground Storage Tank Remediation Actions; WDEQ/WQD's Rules and Regulations, Chapter XVII, Appendix A, October, 1994.

[2] DWEL: RfD and CPF from HEAST

[3] DWEL: RfD from IRIS

[4] DWEL: RfD from IRIS; CPF from HEAST

[5] DWEL: RfD from HEAST

* Wyoming Ground-water Quality Standard: Maximum allowable concentration in ground-water based on federal MCLs or WDEQ/WQD's "Determination of Ground-water Quality Standards" methodology (Appendix C).

** MCL = Maximum Contaminant Level (The maximum permissible level of a contaminant in water which is delivered to any user of a public water system (established by the Safe Drinking Water Act).

@ To be established.

APPENDIX D

MEMORANDA OF AGREEMENT

APPENDIX D

AGENCY CONCURRENCE

The following Agency representatives have read the *Wyoming Generic State Management plan for Pesticides and Ground Water (SMP)* and concur with their agency's roles and responsibilities as outlined in the SMP, provided adequate resources are available for implementation.

Wyoming Department of Agriculture

_____
Name

_____
Title

Wyoming Department of Environmental Quality

_____
Name

_____
Title

Wyoming State Engineer's Office

_____
Name

_____
Title

University of Wyoming Cooperative Extension Service

_____
Name

_____
Title

Spatial Data and Visualization Center

_____
Name

_____
Title

University of Wyoming

_____
Name

_____
Title

U.S. Geological Survey

_____
Name

_____
Title

U.S. Department of Agriculture/
Natural Resources Conservation Service

_____
Name

_____
Title

Consolidated Farm Service Agency

_____
Name

_____
Title

APPENDIX D

CONCURRENCE ON STATUTORY AUTHORITY

The Wyoming Attorney General's Office has reviewed the foregoing "*Component III, Statutory Authority and Enforcement Mechanisms" (Component III)* of the *Generic State Management Plan for Pesticides in Ground Water for the State of Wyoming*, and hereby concurs that the Wyoming Department of Agriculture, the Wyoming Department of Environmental Quality and the Wyoming State Engineer's Office possess the statutory and regulatory authority discussed in *Component III.*

DATED this _____ day of December, 1995.

William U. Hill
Attorney General

Keith Burron
Senior Assistant Attorney General

APPENDIX E

SMP DEVELOPMENT AND IMPLEMENTATION COSTS INCURRED TO-DATE (JUNE/1999)

	USGS[1]	WWRC/SDVC[2]	WWC[3]
1991	-----		$19,165
1992	-----		$19,045
1993	-----		$43,094
1994	----		$42,363
1995	$152,000		$26,153
1996	$100,000		$2,500
1997	$230,000		$4,516
1998	$220,000		$7,552
1999	$250,000		$4,384
Total	$952,000	$903,029	$168,772
Per County Cost:	$119,000/County (Based on 8 counties)	$39,262/County (Based on 23 counties)	Not Applicable

Summary:

Development Costs:

$168,772 (Includes development, and submittal of the *Wyoming Generic State Management Plan for Pesticides and Ground Water* to EPA-Region 8 for concurrence).

Implementation Costs:

$1,855,029 (Includes development of aquifer sensitivity and ground-water vulnerability mapping; ground-water monitoring, data reporting, generation of fact sheets, and public meetings).

[1]USGS – U.S. Geological Survey
[2]WWRC – Wyoming Water Resources Center/SDVC – Spatial Data and Visualization Center
[3]WWC - Western Water Consultants, Inc.

APPENDIX F

GROUND-WATER VULNERABILITY RANKING DATA

APPENDIX F
GROUND-WATER VULNERABILITY RANKING DATA

The following formula was used to determine a ranking of areas within the state to be mapped for ground-water vulnerability. The ranking is based at the county level, and utilizes information on the extent of cropland and urban areas in the county as well as the volume of pesticides applied within the county.

Six pesticides (2,4-D, aldicarb, atrazine, alachlor, picloram, and dicamba) were selected for use in ranking counties relative to ground-water vulnerability. Aldicarb, alachlor, and atrazine were selected because the EPA expects these pesticides will have to be addressed by pesticide-specific SMPs in the future. Picloram and dicamba were selected based on heavy use and detections in ground water in Wyoming. Weights were assigned in the formula based upon the intensity of chemical use on cropland and urban areas. It assumes that irrigated cropland and urban land receive higher rates of pesticide application and thus are more likely to leach chemicals to the ground water. Chemical data utilized in the analysis were obtained from the pesticide evaluation list generated by the GPSC.

URBANINDEX = CHEMINTENSE * URBANWT * URBANAREA * CHEMRATIO

IRRINDEX = CHEMINTENSE * IRRWT * IRRAREA * CHEMRATIO

DRYINDEX = CHEMINTENSE * DRYWT * DRYAREA * CHEMRATIO

INDEX = (URBANINDEX + IRRINDEX + DRYINDEX)/1,000

where:

INDEX	final index value relating chemical application intensity to land use
URBANINDEX	urban index value relating chemical application intensity to urban land use
IRRINDEX	irrigated agriculture index value relating chemical application intensity to irrigated agriculture land use
DRYINDEX	dryland agriculture index value relating chemical application intensity to dryland agriculture land use
CHEMINTENSE	intensity of total chemical use on all possible chemical use lands, including irrigated and dryland agriculture lands and urban land
URBANWT	urban weight assigned to reflect urban chemical use, URBANWT = 6
IRRWT	irrigation agriculture weight assigned to reflect irrigated agriculture chemical use, IRRWT = 4

DRYWT	dryland agriculture weight assigned to reflect irrigated agriculture chemical use, DRYWT = 1
URBANAREA	total urban area per county
IRRAREA	total irrigation agriculture area per county
DRYAREA	total dryland agriculture area per county
CHEMRATIO	the ratio of the six above identified chemicals to all chemicals

The pesticide use intensity formula resulted in the following ranking of counties based on the calculated index:

Rank	**County**	**Index**
1.	Washakie	590.45
2.	Park	200.17
3.	Goshen	176.37
4.	Fremont	146.11
5.	Lincoln	74.31
6.	Laramie	63.47
7.	Big Horn	62.34
8.	Sheridan	58.44
9.	Platte	47.23
10.	Johnson	31.75
11.	Crook	28.36
12.	Natrona*	14.27
13.	Weston*	12.84
14.	Sweetwater*	7.74
15.	Teton*	4.58
16.	Uinta	22.53
17.	Albany	21.17
18.	Converse	19.31
19.	Hot Springs	16.46
20.	Carbon	15.07
21.	Campbell	12.43
22.	Sublette	9.26
23.	Niobrara	3.39

* Natrona, Weston, Sweetwater, and Teton counties were elevated in ranking as per instruction by the WDEQ/WQD because water quality samples from wells in these counties indicate contamination from pesticide usage in the county.

Figure F-1

(Part of Appendix F)

APPENDIX G

PESTICIDE EVALUATION LIST

APPENDIX G

PESTICIDE EVALUATION LIST

The following pesticides have been identified as potential threats to ground water in the State of Wyoming based on the following criteria:

1. relatively large volume use,
2. a history of detection in ground water,
3. elevated leaching potential, and
4. use on lands overlying sensitive aquifers.

COMMON NAME	MOST COMMON TRADE NAME
Alachlor	Lasso
Aldicarb	Temik
Aldicarb Sulfone	Aldicarb by-product
Aldicarb Sulfoxide	Aldicarb by-product
Atrazine	Aatrex
Bromacil	Hyvar XL
Clopyralid	Stinger, Curtail
Cyanazine	Bladex
2,4-D	(Known by many trade names)
DCPA	Dacthal
Dicamba	Banvel
Dichloropropene	Telone
Difenzoquat	Avenge
Hexazinone	Velpar
Metolachlor	Dual
Metribuzin	Lexone, Sencor
Metsulfuron	Ally, Escort
Picloram	Tordon 22K
Simazine	Princep, Primatol, Aquazine
Tebuthiuron	Spike

APPENDIX H

DRINKING WATER REGULATORY LIMITS

NATIONAL PRIMARY DRINKING WATER REGULATIONS

National Primary Drinking Water Regulations (NPDWRs or primary standards) are legally enforceable standards that apply to public water systems. Primary standards protect drinking water quality by limiting the levels of specific contaminants that can adversely affect public health and or anticipated to occur in public water systems.

Organic Chemical (B)	**EPA Standards (mg/L)**	
	MCL[1]	**MCLG[2]**
Alachlor	0.002	0
Atrazine	0.003	0.003
Carbofuran	0.04	0.04
Chlordane	0.002	0
Dalapon	0.2	0.2
Di(2-ethylhexyl)adipate	0.4	0.4
Di(2-ethylhexyl)phthalates	0.006	0
Dibromochloropropane (DBCP)	0.0002	0
Dinoseb	0.007	0.007
Diquat	0.02	0.02
2,4-D	0.07	0.07
Endothall	0.1	0.1
Endrin	0.002	0.002
Ethylene Dibromide (EDB)	0.00005	0
Glyphosate	0.7	0.7
Heptachlor	0.0004	0
Heptachlor epoxide	0.0002	0
Hexachlorobenzene	0.001	0
Hexachlorocyclopentadiene	0.05	0.05
Lindane	0.0002	0.0002
Methoxychlor	0.04	0.04
Oxamyl	0.2	0.2
PAHs (Benzo(a)pyrene)	0.002	0
Pentachlorophenol	0.001	0
Picloram	0.5	0.5
Simazine	0.004	0.004
2,3,7,8-TCDD (Dioxin)	0.00000003	0
Toxaphene	0.003	0
2,4,5-TP (Silvex)	0.05	0.05
PCBs	0.0005	0

Unregulated Contaminants	MCL[1]	MCLG[2]
Aldicarb	0.007	0.007
Aldicarb sulfone	0.007	0.007
Aldicarb sulfoxide	0.007	0.007

[1]MCL: Maximum Contaminant Level
[2]MCLG: Maximum Contaminant Level Goal

Source: U.S. Environmental Protection Agency, Office of Water, Office of Ground Water and Drinking Water, "Current Drinking Water Standards" at http://www.epa.gov/safewater/mcl.html.

Safe Drinking Water Hotline, 1-800-426-4791 (6/17/97)

APPENDIX I

MINIMUM SET OF DATA ELEMENTS FOR GROUND-WATER MONITORING

APPENDIX I

MINIMUM SET OF DATA ELEMENTS FOR GROUND-WATER MONITORING

The EPA's Minimum Set of Data Elements (MSDE) for Ground-water Quality will be used to identify all data generated by ground-water monitoring activities implemented under the SMP. The MSDE will help insure ground-water monitoring data can be communicated efficiently and shared within the ground-water community at all levels of government.

The EPA has defined the MSDE as those basic elements necessary for the EPA to use data from wells and springs across ground-water related programs. The MSDE is characterized by elements that:

- are needed to communicate ground-water data across programs,
- facilitate accessing data from automated information systems other that one's own,
- provide users with a road map for finding other related data; and
- provide a link between water quality and well location information

The MSDE shall consist of the following:

General Descriptor: (describes where the well information is maintained)

- data sources

Geographic Descriptors: (describe the well or spring in relation to the earth's surface)

- latitude
- longitude
- method used to determine latitude and longitude
- description of entity
- accuracy of latitude and longitude
- altitude
- method used to determine altitude
- state Federal Information Procedures System (FIPS) code
- county FIPS code
- altitude

Well Descriptors: (describe various features of a well or spring)

- well identifier
- well use
- type of log
- depth of well at completion
- screened/open interval

Sample Descriptors: (describe different aspects of collecting, analyzing, and recording the results of a ground-water sample)

- sample identifier
- depth to water
- constituent or parameter measured
- concentration/value (in standard units)
- analytical results qualifier
- quality assurance indicator (EPA, 1993b).

APPENDIX J

BEST MANAGEMENT PRACTICE:
PEST MANAGEMENT (595)

**(BMP 595 was developed jointly with the
U.S. Department of Agriculture -
Natural Resources Conservation Service (NRCS)
and is also presented in the
NRCS's Field Office Technical Guide)**

APPENDIX J

BEST MANAGEMENT PRACTICE
PEST MANAGEMENT (595)

DEFINITION

Managing agricultural pest infestations (including weeds, insects, and diseases) to reduce adverse effects on plant growth, crop production, and environmental resources.

SCOPE

This standard establishes the minimum acceptable elements of a pest management program. It includes appropriate cultural, biological, and chemical controls and combinations thereof.

PURPOSE

To develop a pest management program that is both consistent with selected crop production goals and is environmentally acceptable.

CONDITIONS WHERE PRACTICE APPLIES

On cropland where pest control is used.

PLANNING CONSIDERATIONS

1. This practice principally limits the availability of pesticides in or on the soil and on plant foliage that could pollute surface or ground water by reducing the number of pesticide applications and amount of pesticide used.

2. When pest control is needed, the product label instructions and recommendations in addition to recommendations from the following University of Wyoming publications will be used as appropriate:

    Wyoming Weed Control Series
    Control of Field Crop Insects
    Plant Disease Control

3. Pesticide selection will be based on characteristics such as solubility, toxicity, degradation, and absorption based on site characteristics such as soil, geology, depth to water table, proximity to surface water, topography and climate, such that the potential for pollution of surface and ground water is minimized. This information is generally available at county offices of the NRCS and UW - CES.

4. Plan erosion control practices to minimize soil loss and runoff that can carry adsorbed or dissolved pesticides to surface waters as well as avoiding leaching of pesticides into ground water.

5. Practice timing of pesticide application in relation to present soil moisture, anticipated weather conditions, and irrigation to achieve greatest efficiency and reduce potential for offsite transport. The method of pesticide application, such as ground or aerial spraying, wicking, granules, etc., is important since the degree of drift and volatilization can vary considerably.

6. Encourage the use of Integrated Pest Management (IPM) systems that utilize the most appropriate means of pest control including cultural, mechanical, biological and chemical methods. Consider crop rotation and varietal resistance as part of the IPM system. This will remove or reduce pesticide availability as a potential pollutant of water.

7. Scout fields for pests to determine when the treatment threshold has been reached. Treatment threshold for specific insects and crops are available from the University of Wyoming Cooperative Extension Service (UW - CES) offices. Uneconomic and environmentally unneeded application of pesticides can thus be avoided.

8. Pesticides of dissimilar chemistry should be alternated to reduce target species resistance.

9. Some pesticides are highly toxic to non-target organisms. Appropriate precautions should be taken.

10. Consider use of hand weeding for small, isolated areas, or on large areas where labor costs are not prohibitive. Spot spraying rather than full-coverage spraying is another alternative.

11. Irrigation practices can be the cause of potential pesticide loss from the plant environment to surface or ground water.

OPERATION, SAFETY AND MAINTENANCE

The pesticide user must do, in order to follow federal and state laws, the following:

1. Be fully trained and licensed to apply restricted use pesticides in Wyoming.

2. Read and follow all label directions on the pesticide being applied.

3. Calibrate all application equipment before using pesticides.

4. Clean application equipment must be used to insure that no cross-contamination of chemicals will occur.

5. Store pesticides in an U.S. Environmental Protection Agency (EPA) and National Association of Chemical Applicators (NACA)-approved container with a copy of the label attached.

6. Dispose of leftover material and containers according to EPA, label, and local requirements.

7. When required by label or local regulations, wear appropriate protective clothing and equipment.

8. Do not allow pesticide spray to move to off-target locations (drift). Make sure that the pesticide will not move to susceptible non-target organisms and induce damage.

9. In the case of an accidental release of a pesticide which enters or threatens to enter, waters of the state, the pesticide release shall be reported, contained, removed and disposed in accordance with Chapter IV of the Wyoming Department of Environmental Quality's Water Quality Rules and Regulations. The rules and regulations state that action to stop and contain the release will begin immediately and that the Wyoming Department of Environmental Quality/Water Quality Division will be notified immediately. **The Wyoming Department of Environmental Quality's 24-hour emergency telephone number is: 777-7781.**

If further guidance is needed, contact the following:

Wyoming Department of Agriculture
Pesticide Spill Assistance
2219 Carey Avenue
Cheyenne, WY 82002
307-777-7324

The pesticide user may do the following:

1. Be fully trained and licensed to apply general use chemicals to their own property.

2. Read and follow all Material Safety Data Sheets (MSDS).

3. Clean application equipment by spraying all leftover material in the field as long as all label and local regulations are followed.

4. Store pesticides in a properly ventilated, locked building that displays pesticide warning signs.

5. Wear appropriate protective clothing even when not required by the pesticide label or local regulations. Bathe after possible dermal exposure and prior to eating, drinking, or smoking. Exposure to pesticides by oral ingestion, dermal exposure, or inhalation may require immediate first aid measures, assistance from a poison control center, and/or medical personnel. If you are unsure, contact your local poison control center, local medical personnel, or call the Pesticide Accident Hotline (CHEMTREC) at 800-424-9300.

6. Be absolutely sure, if pesticide is applied by a custom applicator or a farm employee who is not the decision maker, that they are aware of the exact location and area to treat.

7. On-farm records detailing pesticide use should be kept.

8. Wellhead areas should be managed in the following manner when mixing pesticide solutions:

    a. Do not mix chemical solutions in an area where overflow from the spray tank will move directly into the wellhead. Keep all mixing of pesticide solutions at least fifty (50) feet away from the wellhead.

    b. If existing wellheads are found to be flawed, that is, not impermeable to a distance ten (10) feet below the ground surface, reconstruction to the wellhead will be done to insure that the top ten (10) feet of casing is impermeable.

SPECIFICATIONS

1. Identify target pest(s), period(s) when most vulnerable to control, and identify selected biological, chemical, cultural, and mechanical control methods.

2. When pesticides are used on irrigated lands, the Wyoming Water Quality Impairment Analysis (WWQIA) procedure will be used to develop a water budget for the crop and to evaluate potential pesticide loss to surface runoff, leaching and deep percolation. The index number will not exceed 6. A copy of the WWQIA may be obtained from a local USDA-NRCS office.

3. All pesticide recommendations including type, rate and formulations will be made using the current UW - CES publications:

B-442	Wyoming Weed Control Series
B543R	Control of Field Crop Insects
B-698.3	Plant Disease Control or other EPA recognized sources.

All pesticides will be used according to current federal and state labels.

4. Adapted cultural control techniques will be included in all pest management plans. Cultural controls include resistant plant varieties, crop rotation, sanitation, timely tillage, host removal, etc.

5. Biological control agents will be used according to U.S. Department of Agriculture - Animal Plant Health Inspection Service (APHIS), county weed and pest district, and UW - CES guidelines and recommendations.

6. Application equipment will be calibrated to apply pesticides as specified on the pesticide label.

7. Rinsate from application equipment and containers or excess pesticide mix will be disposed according to label instructions and state and local disposal standards and regulations.

8. Backflow prevention devices will be installed and maintained to prevent contamination of the water source on sprinkler irrigation systems used to apply pesticides.

9. Direct filling of sprayers or mixing pesticides from wells or surface waters will not be done unless appropriate measures to prevent tank overflow are taken and one of the following procedures is performed:

    a. Water input lines or pipes submerged in the pesticide mixture tank are equipped with anti-siphon or backflow prevention devices.

    b. Filler hoses or pipes remain above the overflow level of the pesticide mixture tank at all times.

    c. An automatic shut-off device is installed on the tank to prevent overflow of the tank.

APPENDIX K

COORDINATED RESOURCE MANAGEMENT (CRM) PROCESS

APPENDIX K

COORDINATED RESOURCE MANAGEMENT (CRM) PROCESS

The solution to natural resource management problems requires the cooperation of landowners, government agencies, and other interested individuals and groups. Coordinated Resource Management (CRM) addresses the dilemma of managing areas with multiple-use ownership, conflicting management objectives and requirements, conflicting land-use demands, and offsite impacts.

Using the best efforts of local people (e.g., private landowners, interested federal, local and state agencies, and other specialists), CRM integrates and coordinates resource uses to accomplish specific goals.

The goal of CRM is "to serve as a vehicle to reach agreement on natural resource management for all users and to promote quality natural resource management through collaborative efforts".

The process is designed to achieve compatibility between the land and resource uses including energy, minerals, crops, livestock production, soil and water, fish and wildlife, forests, and recreation. All resources are effectively managed for short term and long term use and perpetuated for future generations in a condition of high quality. A key element of CRM is the initiation and control of activity by local groups.

Boundaries of a CRM area are suggested by resource problems, community interests, and recognizable geographic considerations.

CRM is a voluntary and cooperative solution to natural resource management issues.

Thirteen basic guidelines for success were established to direct an effective CRM process:

1. CRM is strictly a **voluntary** program.

2. CRM should be **landowner** initiated. It is imperative that local landowners accept and support natural resource management strategies, goals, and objectives, and if possible, landowners take the leadership. If this doesn't happen, CRM will not be successful.

3. All interested or concerned agencies, organizations, and interest groups must be **involved**. They must have ownership and be part of the CRM committee. If these entities are not involved, they will create roadblocks and shoot at your plan.

4. **Facilitation.** The CRM committee should be facilitated by a neutral party that is knowledgeable about natural resource management and facilitation. The facilitator must constantly focus on common goals and neutralize "big mouths, aggression, and arguments".

5. **Common goals** must be developed at the very beginning of the CRM process. Focus on goals before tools. Talk about what you want from the area (i.e. clean water, healthy vegetation, wildlife, etc.) before you talk about how to obtain them (i.e. fences, roads, livestock, etc.). This allows you to open the lines of communication and create middle ground.

6. All agency and organization representatives must have the **authority** to speak and make decisions for their respective entities. If not, a lot of time is wasted getting approval and much confusion is created due to misunderstanding.

7. **Management by consensus**. All CRM committee members must agree on management decisions. This prevents "stacking the deck" such as an interest group constantly voting against an individual or other interest groups to get their way. Every resource manager deserves respect regardless of differences of opinion, goals, or objectives. We must focus on our common goals and work to achieve them.

8. **Needs versus position**. Focus on what management practices are currently needed to improve the natural resource and not the agency policies or positions that have been implemented in the past. Laws and regulations are always flexible enough to implement practices that are needed or will provide the biggest benefit to the resource.

9. Create a **team**. Develop an understanding among CRM committee members and build trust. This is probably the hardest goal to achieve and usually requires teambuilding training.

10. **Commitment**. All CRM committee members must be committed to the process. They must feel needed and have something to contribute. There must be respect among CRM committee members and everyone must have ownership in the plan. There must be a sense of accomplishment and progress.

11. **Management objectives** must be developed and prioritized. Objectives should be measurable, attainable, and strive towards accomplishing common goals. An **action plan** should then be prepared to identify who, when, where, and what will be accomplished. Assignments should be given to individual CRM committee members and subcommittees should be formed to accomplish separate tasks.

12. **Monitoring** is very important to provide baseline data and to provide direction in accomplishing goals and objectives. If monitoring indicates downward trends then replanning can take place to get back on track.

13. **Flexibility** must be in the CRM plan to allow for drought, floods, ownership changes, declining range conditions, etc.

Additional information on the CRM process can be obtained from your local Conservation District, County Extension Agent, or the Wyoming Department of Agriculture.

APPENDIX L

PESTICIDE MANAGEMENT ZONES (PMZs)

APPENDIX L

PESTICIDE MANAGEMENT ZONES (PMZs)

The goal of a Pesticide Management Zone (PMZ) is to preserve registration of a valued pesticide for use by investigating, and adjusting or modifying use of a pesticide product to prevent further contamination; increasing awareness of potential contamination problems among users; and encouraging greater care and selectivity where the pesticide is used.

The PMZ is a voluntary response initiated by the local community that might preempt a regulatory response from state and/or federal agencies.

Specific changes in use for a detected pesticide can be prescribed for the PMZ by the Pesticide Board of Certification where warranted. The PMZ response can be tailored to individual circumstances.

A PMZ may be established based upon the following criteria:

- widespread contamination of a specific pesticide,
- contamination of an aquifer,
- proximity to a public water supply,
- increasing trends of a specific pesticide in a sensitive aquifer,
- severity of misuse, spill, or accidental release, and/or
- proximity to a private drinking water supply well.

The boundaries of each individual PMZ can be based on various criteria, including confirmed pesticide detections, ground-water vulnerability maps, the extent of the aquifer impacted by pesticides, etc. A particular use pattern (e.g., a specific crop or irrigation practice that can be associated with the detection) could be used to include all similar hydrogeologic settings in the PMZ. All lands falling within specifically affected vulnerability classes could make up the PMZ. Several PMZs could be established across the state where ground-water vulnerability and pesticide application are similar, even though contamination occurs in only one area. The PMZ could function in a prevention manner, as well as in response to a specific detection. A statewide PMZ could also be established where usage of the product is broad.

PMZs can be described geographically to include any area of the state. The establishment of a PMZ will allow for intensive management and regulation of a specific pesticide within the boundaries of the PMZ. Pesticide use can be restricted relative to application timing, rates, techniques, farming practices, or any other factor resulting in decreased concentrations in ground water.

Local communities will be responsible for forming a PMZ. PMZs will be structured within the Coordinated Resource Management (CRM) framework and should include representatives from manufacturers and users of the pesticide, the Wyoming Department of Agriculture (WDA), Wyoming Department of Environmental Quality/Water Quality Division (WDEQ/WQD), Weed and Pest Districts, University of Wyoming Cooperative Extension Service (UW - CES), Wyoming Game and Fish Department, Wyoming State Engineer's Office (SEO), and interested parties from within the PMZ boundaries. Local county commissioners, local commercial applicators, individual users, crop associations, product registrants, and University of Wyoming specialists could also be included on the PMZ committee. The PMZ committee will address pesticide contamination of ground water on a local level. The WDA and the WDEQ/WQD will be responsible for overseeing the activities of the PMZ committee.

The PMZ committee will:

- become a local, broad-based source of educational information to members of the PMZ. The PMZ committee will provide education and training of pesticide users to help to reduce future contamination in many cases (coordinate the educational effort),

- review, evaluate, and recommend Best Management Practices (BMPs) that may reduce or eliminate contamination,

- recommend voluntary use pattern changes or other measures which may be necessary to achieve its stated goals,

- coordinate supplemental ground-water monitoring activities,

- advise the Pesticide Board of Certification on local or statewide use restrictions that may be necessary.

The success of the PMZ will be measured by a high degree of public involvement, stable or declining pesticide concentrations, improved pesticide handling and use patterns, and continued registration of specific pesticides. PMZ committees will prepare an annual report for the Pesticide Board of Certification, outlining the year's activities, listing participants, and describing changes in use patterns associated with the PMZ. The report will summarize the value of the PMZ, and a recommendation as to whether or not the PMZ should be continued. Each PMZ will be evaluated by the Pesticide Board of Certification on an annual basis.