United States
Environmental Protection
Agency

Office of Pesticides
and Toxic Substances
Washington, DC 20460

June 1987

Pesticides and Toxic Substances

EPA

Proposed Agricultural Chemicals in Ground Water Strategic Plan

PROPOSED
AGRICULTURAL CHEMICALS IN GROUND WATER
STRATEGIC PLAN

PESTICIDES STRATEGY

U.S. ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF PESTICIDES AND TOXIC SUBSTANCES

JUNE 30, 1987

TABLE OF CONTENTS

FIGURES

TABLES

PREFACE

At the request of the EPA Administrator, Lee Thomas, the Office of Pesticides and Toxic Substances (OPTS) initiated a project to develop a long-term strategic plan for protecting ground water from contamination by agricultural chemicals. The development of this plan is a continuation of Agency efforts, initiated by EPA's Ground Water Protection Strategy, to develop a consistent policy on ground water protection.

The term "agricultural chemicals" in this case is defined as pesticides and fertilizers. In this document, the Agency presents its proposed strategy for the pesticides in ground water concern. A proposed fertilizer strategy will be developed at a later date.

A wide range of ground water experts, including Federal and State managers and staff, scientists, environmental groups, and industry representatives provided input for developing this proposed strategy. A public workshop was held last year at which the participants reviewed an assessment of the problem and provided recommendations on key issues for addressing this pesticide concern. Throughout the whole process of developing the proposed strategy, the Pesticides in Ground Water work group and project leaders consulted extensively with the management and staff from other EPA offices whose programs affected this strategy.

This document is divided into three main parts:

- Summary Problem Assessment
- Proposed Pesticide Strategy
- Implementation Issues

At this time, the Agency is soliciting public comment on its proposed pesticide strategy as well as seeking extensive input on how this strategy can most effectively be implemented.

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This document presents EPA's proposed strategic plan for protecting ground water from contamination by pesticides. It is divided into three parts: (1) a brief summary assessment of the problem; (2) the proposed Agency strategy; and (3) an outline of implementation issues and questions. At this time, EPA is seeking comments on all three parts of the document, including: the findings and assumptions of the summary problem assessment; the proposed policies and programs of the Agency's pesticides strategy; and the implementation questions and issues raised by the Agency's proposed strategic approach.

SUMMARY PROBLEM ASSESSMENT

Ground water is a valuable national resource which can be vulnerable to contamination by pesticides from normal agricultural use as well as from incidences of leaks, spills and disposal. Although the full extent of the problem is not known, enough information has been reported to indicate that the problem is widespread in certain areas of the country. Most findings of pesticides in ground water have been at relatively low levels, although some significant levels have been reported in some areas, resulting in numerous well closings. The full scope of the health and environmental effects associated with pesticides in ground water remains unclear at this time and may not be known for several years. What is clear, however, is that once widespread contamination of ground water by pesticides has occurred, it is often not economically or technically feasible to restore the resource. Even provisions of alternative drinking water or treatment to remove contamination before it is used may be impracticable if contamination is widespread. For these reasons, prevention of contamination must be the primary focus of protection efforts.

The potential vulnerability of ground water to pesticide contamination is determined by a complex set of factors which vary significantly from area to area. Futhermore, the use and value of ground waters vary considerably across the country. In some areas, ground water provides an irreplaceable source of drinking water for large populations, while in other areas, ground water is essentially unusable. These highly variable characteristics of the ground-water resource and the area-specific nature of the pesticide contamination concern suggest the need for a localized protection approach.

The number and complexity of Federal and state programs and statutory authorities which may be used to address the pesticides in ground-water concern is substantial. Currently, EPA administers five major environmental statutes that address some aspect of pesticide contamination in ground water, including the:

- Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)
- Safe Drinking Water Act (SDWA)
- Clean Water Act (CWA)
- Resource Conservation and Recovery Act (RCRA);
- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

In addition to EPA, other federal agencies, such as the U.S. Department of Agriculture (USDA) and the U.S. Geological Survey (USGS) of the Department of Interior, are key institutions in addressing this issue. And just as important, the states have a major role to play in addressing ground-water contamination. Here again, at the state level a number of different agencies and statutes are involved in the protection of ground water and pesticides management. A number of states have already taken aggressive action in dealing with the concern for ground-water contamination by pesticides.

Protection of ground water from pesticide contamination will require a co-ordinated approach among these federal and state agencies. Development of a comprehensive strategy is one of the first steps needed in moving toward an integrated and successful management approach.

PESTICIDES STRATEGY

The purpose of the strategy is to articulate EPA's long-term approach for managing the pesticides in ground-water concern. The proposed strategy is organized into three chapters that address the key issues associated with: the

Agency's environmental goal; its prevention strategy; and its response strategy. Each of these chapters first describes the factors and options which EPA considered, followed by a detailed description of the Agency's proposed policy choices. The Agency made its policy choices based on consideration of its legislative statutes, its long-term policies for pesticides registration, and its general Ground-Water Protection Strategy (1984).

Environmental Goal: EPA's environmental goal will be to protect the ground-water resource with specific attention given to preventing contamination of current and potential drinking water supplies. The Agency will also use MCLs or other EPA-designated protection criteria as its basic points of reference for both prevention and response decisions when addressing pesticides in ground-water concerns. Specifically, the Agency will adopt the following policies as its environmental goal for protecting ground water from pesticide contamination:

1. The Agency will use a differential protection approach to protect the ground-water resource. With this approach, the Agency will apply baseline protective efforts primarily to those waters that are a current or potential source of drinking water or that are vital to fragile ecosystems. Additional measures may be taken to ensure protection of certain "high priority ground waters".

2. EPA will use MCLs, as defined under the SDWA, as its basic protection criteria. When no MCL exists, EPA will use the equivalent of an MCLG for non-carcinogenic pesticides and a negligible risk level for carcinogenic pesticides. The Agency will also address any unreasonable risks to ecosystems.

3. The Agency will use its protection goal for pesticides in ground water as its basic point of reference for both prevention and response actions.

Prevention Policy and Program: The Agency's proposed strategy to prevent unacceptable pesticide contamination of ground water will be based on a three-pronged management approach with varied Federal-state roles. Specifically, EPA's prevention strategy will consist of the following policies:

1. EPA will continue to take uniform action for pesticides posing widespread, 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.

2. EPA will also adopt a new approach of differential management of pesticide use based on differences in ground-water use, value and vulnerability to an extent that is administratively feasible. County-level or state-level measures, based on ground-water vulnerability, will be employed including use cancellations. In some cases, the user will have to determine the applicability of differential prevention measures based on local field conditions or his location in an area of "high priority ground waters" (i.e., high use and value ground waters).

3. EPA will encourage the development of a strong state role in local management of pesticide use to protect the ground-water resource. State pesticide management plans will be used to strengthen EPA's foundation for pesticide registration decisions. In some cases, the registered use of a pesticide in a state will depend on the presence and adequacy of such a state management plan. Under a management plan, a state will have the opportunity to develop and implement highly-tailored prevention measures based on area-specific differences in ground-water use, value and vulnerability.

4. The user's role in preventing ground-water contamination is pivitol; users will be provided with better information and training to enable them to make environmentally sound decisions.

5. Registrant responsibilities will need to increase in three areas: (1) technical support of the user in the field; (2) ground-water monitoring to ensure the adequacy of pesticide management plans in

protecting ground water; and (3) the development of safer alternative pesticides.

6. Increased monitoring of pesticides in ground waters is critical to the implementation of this strategy. EPA will establish an "early-warning" or "yellow light/red light" approach to prevent further area contamination once it is detected. Under this system, MCLs or other EPA-specified protection criteria will be used as the points of reference to evaluate, and when necessary, change pesticide management plans.

Response Policy and Program: The Agency's policy for responding to pesticide contamination of ground water emphasizes Federal-state coordination and statutory enforcement activities. More specifically, these policies include:

1. Where a pesticide has reached unacceptable levels in ground water, strong actions are to be taken to stop further contamination. These actions can range from enforcement measures to modification of the way a pesticide is managed, including geographic restrictions of the pesticide's use.

2. EPA will encourage a strong, state role in responding to contamination. A state's management plan should consider the development of a valid corrective response scheme.

3. EPA will continue to develop and emphasize enforcement of MCLs to protect users of public drinking water systems. Under SDWA's emergency powers, EPA will consider issuing orders requiring responsible parties to provide alternative water supplies when levels of pesticides present an imminent and substantial endangerment to public health.

4. EPA and the states will place greater emphasis on coordinating FIFRA, SDWA, and CERCLA enforcement activities to identify parties responsible for ground-water contamination as a result of the misuse of pesticides, including illegal disposal or leaks and spills.

5. On a case-by-case basis, EPA may assist states by undertaking CERCLA Fund-financed removal actions to provide alternative drinking water supplies where there is an imminent human health threat.

6. The question of who should pay for corrective actions at sites contaminated by the approved use of a pesticide is a legislative question. EPA believes that several aspects of the problem must be considered before a decision can be made.

IMPLEMENTATION ISSUES

The final part of this document puts forth a number of implementation issues and questions raised by the proposed pesticide strategy. The Agency is particularly interested in receiving input on these issues before finalizing its strategy and initiating the development of an implementation plan. To reflect the presentation of the pesticide strategy, this part of the document is also arranged into three chapters covering the implementation issues associated with the Agency's proposed policies for its environmental goal, prevention strategy and response strategy.

Environmental Goal: The key implementation issue underlying EPA's goal is:

1. What definition and process should be used to identify ground waters as potential drinking water sources that require baseline protection.

2. What definition and process should be used to identify "high priority ground waters"?

Prevention Policy and Program: There are six key areas of implementation issues raised by EPA's prevention policy and program:

1. Generic national control measures;
2. Barriers to implementing a differential approach;
3. State management plan - criteria, EPA oversight, and support.

4. Support of User decision-making support;
5. Research and development priorities; and
6. Monitoring/early-warning system - Mechanism and Criteria

Response Policy and Program: EPA identified the following four key implementation issues arising from its proposed response program:

1. Under what circumstances should EPA consider not registering a pesticide in a state that does not have a corrective action scheme?

2. What indirect EPA responses, including technical assistance to the states or national public information and educational efforts, should be a priority for development?

3. What can be done to facilitate coordination of enforcement activities under FIFRA, RCRA, SDWA, and CERCLA to identify parties responsible for contamination resulting from misuse, such as illegal disposal or leaks and spills? and,

4. When should EPA consider assisting a state under the Agency's CERCLA removal program? What should be the criteria for defining an imminent health threat resulting from pesticide contamination of drinking water?

PART I

PROBLEM ASSESSMENT SUMMARY

PROBLEM ASSESSMENT SUMMARY

INTRODUCTION

The purpose of this part of the document is to provide a brief summary assessment of the pesticides in ground-water concern. This assessment highlights the basic characteristic of the problem which EPA considered in developing its proposed strategy. A more detailed description of the problem can be found in the background documents and strategies listed in Table I-1.

Table I-1

Examples of Key Reports on the Ground Water Problem and Recommended Strategies

1. ***Ground-Water Protection Strategy***
   U.S. Environmental Protection Agency
   Office of Ground-Water Protection
   (EPA, 1984)

2. ***Pesticides in Ground Water: A Background Document***
   U.S. Environmental Protection Agency
   Office of Ground-Water Protection
   (EPA, 1986)

3. ***Improved Protection of Water Resources from Long-Term and Cumulative Pollution: Prevention of Ground Water Contamination in the U.S.***
   U.S. Environmental Protection Agency
   Office of Ground-Water Protection
   (EPA, 1987) (Prepared for OECD)

4. ***Protecting the Nation's Groundwater from Contamination***
   Office of Technology Assessment
   U.S. Congress
   (Washington, D.C., 1984)

5. ***Ground-Water Quality Protection: State and Local Strategies***
   National Research Council
   Washington, D.C., 1986)

6. ***Agricultural Effects on Groundwater Quality***
   Congressional Research Service
   U.S. Congress
   (Washington, D.C., 1986)

7. ***A Congressional Agenda to Prevent Groundwater Contamination: Building Capacity to Meet Protection Needs***
   Environmental and Energy Study Institute
   (Washington, D.C., 1986)

8. ***Groundwater Protection: Saving the Unseen Resource***
   The Conservation Foundation
   (Washington, D.C., 1987)

9. ***The Leaching Fields: A Nonpoint Threat to Groundwater***
   California Assembly Office of Research
   (California, 1985)

10. ***Groundwater Contamination in the U.S.***
    Pye, Patrick, et al
    (Philadelphia, 1983)

CHAPTER 1

GROUND WATER: THE RESOURCE

1. Use and Value of Ground Water

Ground water is a critical national resource which provides about one-fourth of the total water use in the United States. It is the source of drinking water for nearly half of the total United States population, and in rural areas ground water may be the only, or at least the dominant, source of drinking water. In eight states, 90% or more of the entire state population depends on ground water for their domestic water supply (Table I-2).

By volume, irrigation consumes the largest amount of ground water, accounting for about two-thirds of ground-water withdrawals in 1975. As shown in Figure I-1, withdrawals of ground water nearly tripled between 1950 and 1980, reaching 88 billion gallons per day in 1980. In addition to meeting the nation's demand for water, ground water plays an important environmental function. For example, ground water provides recharge to surface streams and sustains aquatic wetlands and terrestrial ecosystems. In coastal areas, ground water helps prevent saltwater intrusion into potable water supplies.

2. The Nature of Ground Water

Ground water is found within the earth in geological formations called aquifers (Figure I-2). Vertical geological profiles of ground-water systems are divided into different zones. The uppermost zone is called the unsaturated zone, and by definition does not contain enough water to enable a well drilled into this zone to yield usable quantities. The properties of the unsaturated zone, however, control the extent of recharge of water from the land surface to the saturated zones below. The extent of recharge to an aquifer can be thought of as a balance between infiltration or percolation of water down through the unsaturated zone and horizontal runoff on the land surface, or return of moisture to the atmosphere by evapotranspiration. The properties of the land surface and unsaturated zone material that control recharge include the slope, extent of vegetation cover, thickness of the

Table I-2

Percentages Of People Relying On Ground Water For Domestic Use

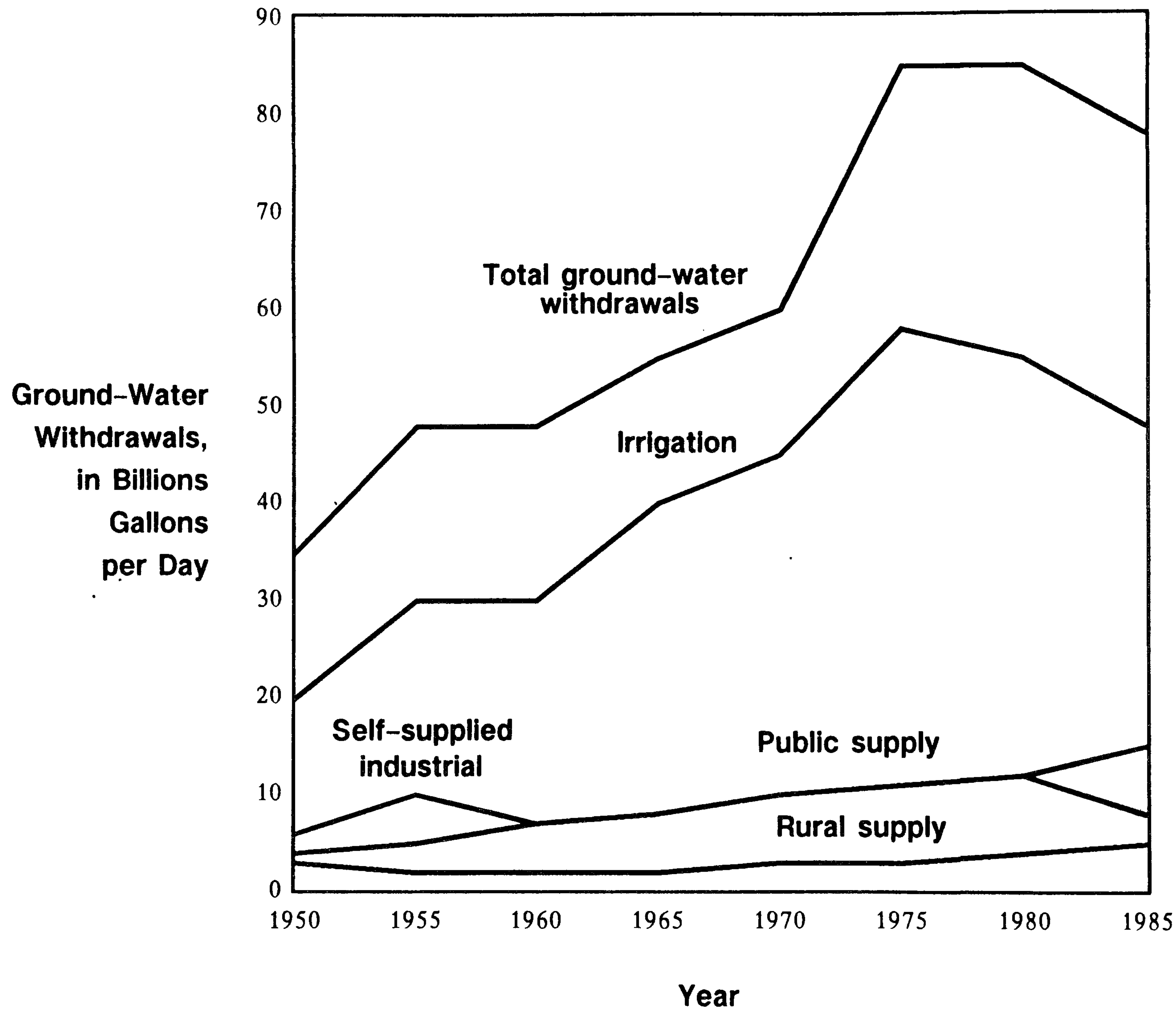
States	Percent of State Population
Arizona, Florida, Hawaii, Idaho, Mississippi, Nebraska, Nevada, New Mexico	Over 90
South Dakota	80 - 89
Delaware, Iowa, Maine	70 - 79
Alaska, Indiana, Kansas, South Carolina, Washington, Wisconsin, Utah	60 - 69
Arkansas, California, Illinois, Louisiana, Michigan, Montana, New Hampshire, North Dakota, Tennessee, Texas, Vermont, West Virginia, Wyoming	50 - 59
Georgia, Minnesota, New Jersey, New York, Ohio, Pennsylvania, Virginia	40 - 49
Alabama, Connecticut, Massachusetts, Missouri, North Carolina, Oklahoma, Oregon	30 - 39
Colorado, Kentucky, Rhode Island	20 - 29
Maryland, Puerto Rico, Virgin Islands	Under 20

Note: For the purpose of this report, Puerto Rico and the Virgin Islands are treated as states in this table and all following tables. The information for these tables has been developed from Volume II of this report

Source: State Ground Water Program Summaries, Office of Ground Water Protection, EPA, March 1985

Figure I-1

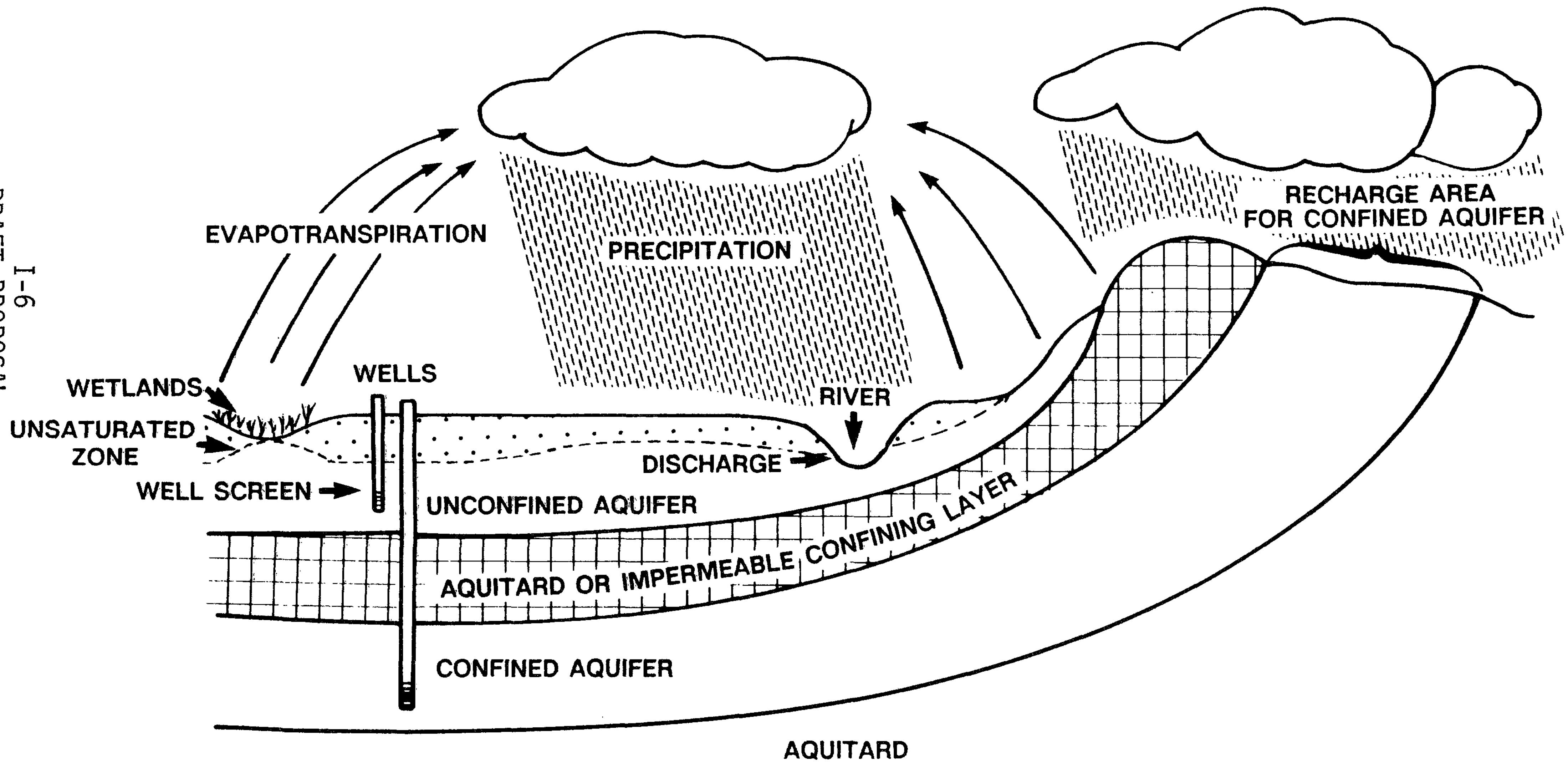
Trends in Ground–Water Withdrawals 1950–1985



Source: U.S. Geological Survey
Cited in: Improved Protection of Water Resources From Long-Term and Cumulative Protection, EPA, 1987

Figure I–2

Illustration of Relationships Within the Hydrologic System



unsaturated zone, the inherent capabilities of the unsaturated zone materials to conduct water, and the presence of cracks or fractures in the zone.

The saturated zone is the aquifer itself --- the geological zone from which water may be obtained by pumping. Often there may be several aquifers in a geological profile (Figure I-2), separated by layers of less permeable rock and clay. The boundary between the unsaturated zone and the uppermost aquifer is called the water table; the water in this area is an unconfined, or water table aquifer. Surface water can enter such an aquifer through percolation. The lower aquifer in Figure I-2 is a confined aquifer; the entry point or recharge zone for water to reach this aquifer may be far away from the point of withdrawal. Even when aquifers appear to be separated from one another as shown in Figure I-2, they may be connected through interruptions or fractures in the intervening layers.

The characteristics of aquifers can vary greatly in area, depth below the land surface, volume of water stored, permeability, interconnectedness, and velocity of flow. Some aquifers underlie only small local areas, while others span thousands of square miles and cross several state boundaries. Usable aquifers are found almost everywhere in the United States. Usable aquifers are found almost everywhere in the United States (Figure I-3). Water is recharged to, or enters, aquifers by percolation from rainfall, snow-melt and runoff, or has been trapped in aquifers since geologic time. Many aquifers may also have natural discharge areas, such as springs, marshes, or stream-beds. It has been estimated that about 30% of the flows in streams and rivers during an average year is provided by ground-water discharge.

The rate of ground-water movement through an aquifer depends largely on the permeability of the aquifer. In a uniform aquifer, the velocity of the ground-water movement may range from 1 meter/year to 1000 m/yr, with the most common rate being between 10-100m/yr. Slow rates of movement can prevent contaminants from spreading or mixing rapidly, concentrating them in slow-moving plumes that may remain undetected for long periods of time. Such time lags could result in contamination being found long after the source of contamination has been effectively removed.

Figure I-3

PRODUCTIVE AQUIFERS AND WITHDRAWALS

FROM WELLS IN THE UNITED STATES

An aquifer's permeability is determined largely by the types of solid materials or geological formation of the aquifer. In some areas, the aquifer may consist of fine sand or include significant amounts of silt and clay and thus have a much lower permeability.

CHAPTER 2
PESTICIDES IN GROUND WATER: THE CONCERN

1. Extent of Contamination

Until a few years ago, most people believed that ground water was protected from contamination by soil and rock formations. This general belief began to change in the late 1970's with the findings of chemicals in a number of wells across the country. In 1979, two pesticides were discovered in ground water: dibromochloropropane (DBCP) in California and aldicarb in New York. Additional monitoring in other states shortly thereafter showed DBCP in ground water in Arizona, Hawaii, Maryland, and South Carolina; and aldicarb was found in Wisconsin in 1980.

Perhaps the most serious case of pesticide contamination of ground water was the discovery in 1982 of ethylene dibromide (EDB) in two California wells and three wells in Georgia. By the end of 1983, EDB contamination of ground water had been discovered in 16 different counties in California, Florida, Georgia, and Hawaii. These findings caused EPA to issue an immediate suspension of all EDB soil uses in September 1983.

Until the discovery of pesticides in ground water, Federal and state agencies did not monitor ground water for these chemicals. There were several reasons: most ground-water monitoring until that time focused on urban rather than rural agricultural areas; analyses of water were usually for volatile organic contaminants, while most pesticides have low volatility; and reports of positive findings of organic contaminants did not always distinguish between surface and ground-water systems.

The discovery of DBCP, aldicarb, and EDB in certain areas of the country stimulated a number of monitoring activities by Federal and state agencies to investigate the extent of the problem. By 1986, a total of 20 different pesticides had been detected in ground water in 24 states where the source of the contaminant was most probably a result of agricultural application (nonpoint source) rather than from spills or other point sources of the pesticides (Table I-3 and Figure I-5). It is important to note that ground-water contamination resulting from normal pesticide use applications may occur over large geographical areas and result in exposure to large segments of the population.

Some of the more important findings from recent state monitoring efforts are as follows:

- California: Approximately 57 different pesticides have been detected in California's ground waters; one-half of these were attributed to point sources (leaks and spills) rather than normal pesticide application. Nearly 2500 drinking water wells were found to contain DBCP; about 60% of there had levels above the state standard of 1 part per billion (ppb). About 700,000 people may have been exposed to DBCP via drinking water as a result.

- Hawaii: Thirteen public drinking water wells have been found to be contaminated by EDB, DBCP, and/or trichloropropane; these wells serve more than 130,000 people.

- Florida: EDB has been found in about 10% of public and private drinking water wells serving more than 50,000 people. About 1200 wells have been closed.

- New York: On Long Island, almost 2,000 wells were found to contain aldicarb; about 50% of these wells had levels which were above the New York state standard of 7 ppb.

- Minnesota: Separate surveys of private and public drinking water wells have been conducted recently. In 1986, one or more pesticides were detected in 52% of 225 private wells; and in an ongoing survey of public wells, one or more pesticides have been detected in 29% of 366 wells sampled. The average concentration of pesticides found in these wells were below the state health standards.

- Iowa: Nine herbicides and three insecticides have been detected in monitoring studies conducted in Iowa. For the most part, concentrations were less than one part per billion; the major source of these pesticides were attributed to normal agricultural application. Monitoring data indicates that about 27% of the population consume drinking water which contains low concentrations of pesticides.

While all of the above state surveys have expanded our knowledge of pesticide contamination of ground water, they cannot be assembled into a valid national estimate of the extent of ground-water contamination. Many of these state surveys have been conducted in areas where contamination was already

Table I-3

Pesticides Found In Ground Waters Of 24 States

PESTICIDE	USE*	STATE	TYPICAL POSITIVE ppb**
Alachlor	H	MD, IA, NE, PA, MN	0.1 - 10
Aldicarb (sulfoxide & sulfone)	I,N	AR, AZ, CA, FL, MA, ME, NC, NJ, NY, OR, RI, TX, VA, WA, WI	1 - 50
Atrazine	H	PA, IA, NE, WI, MD, MN	0.3 - 3
Bromacil	H	FL	300
Carbofuran	I,N	NY, WI, MD	1 - 50
Cyanazine	H	IA, PA, MN	0.1 - 1.0
DBCP	N	AZ, CA, HI, MD, SC	0.02 - 20
DCPA (and acid products)	H	NY	50 - 700
Dicamba	H	IA, MN	0.1 - 2
1, 2 - Dichloropropane	N	CA, MD, NY, WA	1 - 50
Dinoseb	H	NY	1 - 5
EDB	N	CA, FL, GA, SC, WA, AZ, MA, CT	0.05 - 20
Fonofos	I	IA	0.1
Metolachlor	H	IA, PA, MN	0.1 - 0.4
Metribuzin	H	IA	1.0 - 4.3
Oxamyl	I,N	NY, RI	5 - 65
Propachlor	H	MN	0.2 - 0.5
Symazine	H	CA, PA, MD, MN	0.2 - 3.0
Terbufos	I	IA, MN	0.3 - 7
1, 2, 3 - Trichloropropane	N (impurity)	CA, HI	0.1 - 5.0

*H = herbicide; I = insecticide; N = nematicide
**ppb = parts per billion; 1 ppb = 1/1000 ppm; 1ppm = 1 mg/l

Figure I-4

Numbers of Pesticides Found in Ground Water As a Result of Agricultural Practice

known to exist and have been conducted for different purposes and according to different design strategies. In order to get a better handle on the extent of the problem, EPA has initiated a comprehensive statistically-based survey of drinking water wells across the country. Results from this survey are expected to be available in 1989.

2. Potential Health Effects.

The health effects of chemicals can be divided generally into two classes: acute effects and chronic effects. Acute effects result from contact with high levels of a chemical over a short period of time, while chronic effects generally occur as a result of long-term exposure to low levels of a chemical. Acute effects, such as nausea, skin irritation, etc., are usually easier to identify because they occur soon after exposure. Chronic effects, on the other hand, are harder to document, particularly because of the long time interval between exposure and outcome.

Generally, concentrations of pesticides in ground water have been found at low levels, and therefore most of the concern has been focused on the potential for chronic effects, such as cancer, mutations, birth defects, and immunological changes. However, there are many gaps in our information about chronic effects of pesticides in ground water. Although the toxicity and general chronic effects for certain pesticides may be known, it is difficult to associate a health problem due to exposure to the chemicals in drinking water. Assessing the risk posed by a pesticide in ground water involves knowing the precise combination of hazard and the duration and intensity of exposure. Furthermore, the risk can be complicated by a combination of several factors such as degradation processes, routes of exposure, and the effects of other chemicals in the ground water.

Health risk assessments are a fundamental tool used by EPA programs to characterize the potential for harm to human health by chemical substances in the environment. These assessments form a key part of the basis upon which policy makers determine whether, and to what extent, measures to reduce risks are warranted.

EPA's method of risk assessment for potential ground-water contaminants is based on a four-part process which includes: (1) hazard identification, (2) dose-response evaluation, (3) human exposure evaluation and (4) risk characterization. With respect to pesticides in ground water, EPA carries out several risk assessment activities. One of the Agency's more recent risk assessment activities has been the development of health advisories (HA's) for 60 known or potential leaching pesticides. These health advisories describe the concentrations of contaminants in drinking water at which adverse effects are expected to occur. In the near future, the Agency expects to develop enforceable standards or maximum contaiminant levels (MCLs) for pesticides in drinking water.

3. Costs of Contamination

Measuring the costs to society from chemicals in ground water is a difficult task. Some economists have estimated the costs and benefits of ground-water contamination policies using a "damages avoided" framework on a site-by-site basis. However, this approach has certain limitations, namely that it may not be applicable to a national analysis. Another way to estimate what society must pay to reduce a contamination risk is to appraise the avoidance costs. A USDA report by Nielson and Lee, 1987, employed this approach. In this report, the authors estimated that the costs of avoiding risks imposed by ground-water contamination by pesticides are potentially significant. Monitoring costs were the major expense for households, ranging from $0.9 to $2.2 billion, with $1.4 billion being the "best" estimate.

The other major expense for households seeking to avoid risks from pesticides in their drinking water was the costs of responding to contamination. Installing home-water treatment units or providing alternative drinking water supplies are possible options, but the costs can vary significantly, depending on the system used and the size and location of the area covered. Although national estimates are not possible to develop, data do suggest that these types of actions could result in substantial costs, particularly to small communities and private well owners.

Another option for responding to pesticide contamination of ground water is to clean up or contain a contaminated aquifer. Containment or clean-up techniques are much more expensive than the previous options and may be economically feasible only for point source contamination, e.g. leaks and spills. Cleaning up widespread nonpoint sources of contamination from pesticide application would be even more expensive and may not be technologically or economically feasible for most areas. The estimated cost of cleaning up a hazardous waste site that involves ground-water pumping and installation of a cutoff wall ranges from $1.9 million to $6.1 million, depending on the volume of ground water pumped.

In addition to these direct costs associated with preventing and responding to contamination of ground water, there are a number of other indirect costs that society may face. For example, ground-water contamination could result in crop loss and a decline in property values as well as increased medical costs and the costs of possible law suits.

Because of these problems associated with the potential high costs and technical complexity of responding to ground-water contamination of pesticides, it is critical that Federal and state agencies develop effective management strategies for preventing contamination.

CHAPTER 3
PESTICIDES IN GROUND WATER: CAUSATIVE FACTORS

An effective prevention strategy must consider the complex set of factors which determine the likelihood of a pesticide reaching ground water. The factors and their interactions vary greatly depending on specific local conditions and circumstances. For this reason, the problem of pesticides in ground water, although a national concern, must be addressed at a more localized level. The following discussion outlines the set of factors which affects ground-water contamination. These factors have been grouped into four major areas: sources of contamination, chemical-physical characteristics of the pesticide, ground-water vulnerability and agricultural practices.

1. Sources

Ground water may become contaminated by pesticides at any point in their use cycle (Table I-4): during manufacture, distribution in commerce, storage, use on the land or in industrial settings, or disposal. These sources of potential contamination may be grouped together into two categories based on the characteristic of the contamination potential and on the types of actions that may be taken to prevent contamination.

The first category includes accidental spills and leaks of pesticides at manufacturing facilities or distribution points such as agricultural chemical dealerships or commercial applicator facilities, where bulk chemicals are stored and handled. Also included in this category are places, including hazardous and municipal waste landfills and other waste handling or treatment facilities, where chemical wastes are disposed of. Ground-water contamination resulting from leaks and spills generally result in plumes that are relatively localized. The origin of such "point source" contamination may be prevented, and clean-up using available techniques may be possible.

The much larger second category of sources is application of pesticides to crops, rangeland, forests and right-of-way. When pesticides are applied to the land, they are carried above, across, and through the ground by wind,

Table I-4

Potential Sources of Pesticide Contamination of Ground Water

	Manufacturers/ Formulators	Dealer	Industrial User	Land Application
SPILLS AND LEAKS				
Storage Areas	x	x	x	x
Storage Tanks/ Pipelines	x	x	x	x
Loading/Unloading	x	x	x	x
Transport Accidents	x	x	x	x
DISPOSAL				
Process Waste	x		x	
Off-specification material	x			
Cancelled Products	x	x	x	x
Containers	x	x	x	x
Rinsate			x	x
LAND APPLICATION				x
Leaching				x
Backflow to Irrigation Well				x
Run-in to Wells, Sinkholes				x
Mixing/loading areas				x
Feed Lots				x

rainfall, runoff, and infiltration. Pesticides dissolved in runoff water are carried to nearby surface water or may enter ground water through direct infiltration at the point of application or after traveling via the surface or through soil to ditches or other runoff retention areas. They may also reach ground water through sinkholes or poorly constructed well casings or abandoned wells.

Of the 1.1 billion pounds of pesticide chemicals used in 1984, 77% or 861 million pounds, were used in agriculture, with the rest used by industry, government, and home and garden users. There are about 600 actual pesticide chemicals in common use, and these are formulated into over 45,000 individual products. Important types of pesticides include insecticides, herbicides, fungicides, plant growth regulators and rodenticides. Herbicides form the largest use class, as shown in Table I-5. They are also the most rapidly growing class (Figure I-6): applications of herbicides now account for nearly 90% of the acreage of all major crops treated. For pesticides as a whole, six crops (alfalfa, corn, cotton, sorghum, soybeans, and wheat) account for about 90% of all acre-treatments. This concentration of pesticide use on a few major crops means that the application is heavily concentrated in certain major agricultural areas, such as the upper Midwest of the U.S.

2. Physical-Chemical Properties

Not all pesticides are equal in their ability to reach ground water. Just as there are great variations in the natural vulnerability of ground water to contamination, there are great variations in the chemical properties of pesticides which control their tendency to leach to ground water. Although ground-water contamination by pesticides is a relatively recent public concern, research on the environmental fate of pesticides in soil over the last two decades has provided a general understanding of the pesticide properties and environmental conditions which together determine the potential for a pesticide to reach ground water.

Table I-5

Volume of U.S. Pesticides Used, by Class and Sector 1985 Estimates

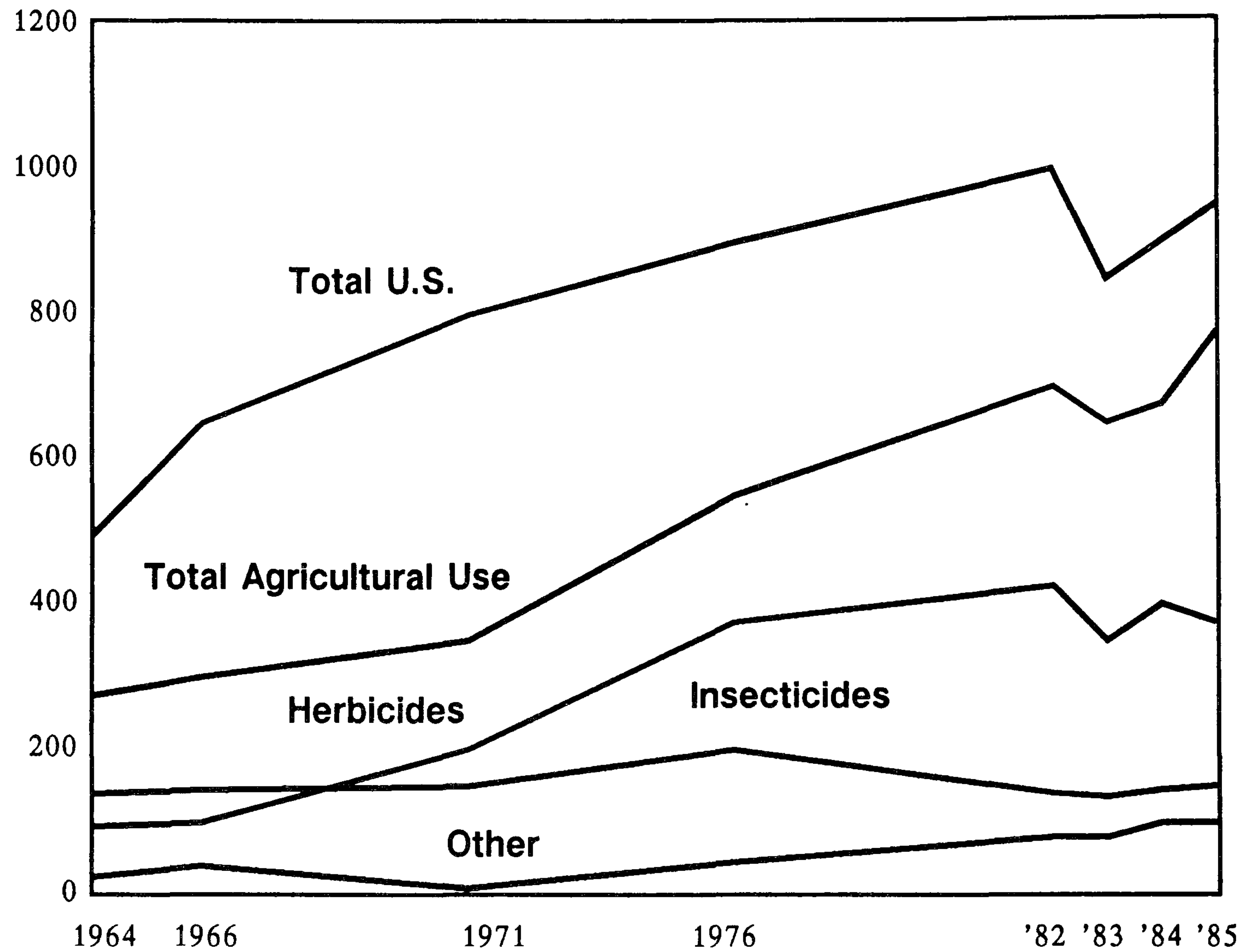
	(millions of pounds of active ingredients)				
	Herbicides[1]	Insecticides[2]	Fungicides[3]	Other[4]	Total
Agriculture	525	225	51	60	861.0
Ind./Comm./Govt.	115	40	21	.1	176.1
Home & Garden	30	35	12	.1	75.1
Total	670	300	84	60.2	1112.2

Source: EPA Estimates from the Office of Pesticides Program, Economic Analysis Branch.

1 Includes plant growth regulators.
2 Includes miticides and contract nematicides.
3 Does not include wood preservatives.
4 Includes rodenticides, fumigants, and molluscides.

Figure I-5

U.S. Pesticide Total Use and Estimated Sector and Class Shares 1964–1984



Source: EPA Estimates from the Office of Pesticide Programs, Economic Analysis Branch.

Note: Excludes wood preservatives, disinfectants, and sulfur.

*Revised 1982 numbers.

No single property of a pesticide chemical uniquely determines its potential to leach; rather, the interaction of several independent properties governs leaching behavior. Tests for these properties are required for registration of all pesticides used on crops. The properties include:

- water solubility: the propensity for a pesticide to dissolve in water. Pesticides with water solubility can more easily be carried in solution in water percolating down to the water table. Solubility of greater than about 30 parts per million has been selected as a "flag" indicating a pesticide with a high potential to leach (Cohen et al, 1983).

- hydrolysis: the rate of degradation of a pesticide in water when no other process is taking place. This rate is particularly important because after a pesticide has leached below the soil zone of active biological activity, hydrolysis is essentially the only process available to decompose a pesticide. The time for hydrolysis to destroy half the amount of a pesticide present in solution is called the hydrolysis half-life; a value greater than about 6 months indicates chemicals with high potential to reach ground water.

- soil adsorption: the propensity of a chemical to bind soil, defined as the ratio of concentration in soil to concentration in water at equilibrium. This ratio is denoted as Kd. A second measure, Koc, is a similar ratio based on the organic matter content of the soil, since organic matter is most active in binding chemicals present in soil. Pesticides with low values of Kd and Koc bind less strongly to soil and are therefore more likely to leach. Most of the pesticides found in ground water have Kd values less than about 5 (often less than 1); the corresponding Koc values are less than 300.

- soil degradation: a simplified measure of pesticide persistence in soil, usually measured as the time required for disappearance of one-half of the residue present. This time is called the half-life of the pesticide, and measures degradation by both chemical and biological processes in soil. Soil half-lives are measured by field experiments required for registration of pesticides; half-lives greater than about three weeks indicate soil persistence sufficient to allow high potential for leaching.

The downward movement of a pesticide is essentially driven by competition between the processes of degradation and leaching. A pesticide which degrades rapidly in surface soil (or which is efficiently taken up by plant roots) is unlikely to survive long enough to move downward under the influence of infiltrating water; and a pesticide which is tightly bound to soil will be unlikely to move downward no matter how long it remains in the soil. The combination of relative persistence in soil and lack of binding to the soil are the two dominant characteristics of pesticides which have the potential to leach to ground water.

3. Local Ground-Water Vulnerability

A number of factors determine the general vulnerability of local ground water to contamination by pesticides. Local climatic conditions are one of the most important determinants. Under this category, the amount of rainfall affects the amount of water available for transporting pesticides through soil to underlying ground water. Other key climatic conditions that affect pesticide degradation processes and vulnerability to contamination are soil and air temperatures.

The depth of the aquifer is another key determinant. If a pesticide has to travel a great distance to reach an aquifer, it has a greater chance to be diluted or degraded. A third key determinant of ground-water vulnerability is the type of soil present at a pesticide application site. The properties of the soil can vary greatly and depend on:

- clay content: the amount of clay minerals in the soil. The clay fraction provides cation exchange capacity to bind positively-charged chemicals (cations). Clay soils also have a high surface area which further contributes to adsorption capacity.

- organic matter content: also contributes to adsorption of pesticides to soil, particularly neutral species. In fact, pesticides which are applied to soils high in organic matter will often be applied at higher rates to compensate for this absorption.

- soil texture: refers to the percent of sand, silt, and clay in soil. Leaching is more rapid and deeper in course or light-textured soils than in fine or heavy-textured clay soils.

- soil structure: refers to the way soil grains are grouped together into larger aggregates -- as plates, prisms, blocks, uniform grains. Water and dissolved pesticides can percolate through cracks in soil structures. Often large cracks or channels resulting from soil biota are present, allowing rapid infiltration.

- porosity: a function of total pore space and pore size in soils. Porosity is determined by soil texture, aggregation, and particle shape. Water transport is more rapid in highly porous soils.

- soil moisture: interstitial water in the soil matrix ultimately dissolves and transports pesticides that are not adsorbed. Upward movement may also occur through capillary action or by evapotranspiration, in which water in the soil is lost to the air.

All of these factors determining general ground-water vulnerability can be assessed for any given site if data is available. Using these sets of factors, the Natural Water Well Association developed a system (DRASTIC) for assessing ground-water vulnerability. As an initial step in designing their national pesticide survey, EPA used the DRASTIC system to evaluate the average vulnerability of counties in the U.S. (See Figure I-7). The major drawback of this approach is that it does not account for the large variability of ground-water vulnerability within a given county, as Figure I-8 clearly demonstrates. Moreover, the presence of certain local features can make a certain area more susceptible to ground-water contamination than an average county-vulnerability score would indicate. These local features include the presence of sink holes, fissures, mine shafts, abandoned and uncapped wells, or poorly constructed and protected wells. Because of these problems, EPA has not used county average DRASTIC scores as a basis for pesticide regulation.

4. Agricultural Practices

The final group of factors affecting the potential for pesticides to contaminate ground waters are local agricultural practices. Obviously such practices will vary greatly across the country depending on the crops grown, local pest control needs and the preferences of the grower. Key factors that are part of the agricultural practices include:

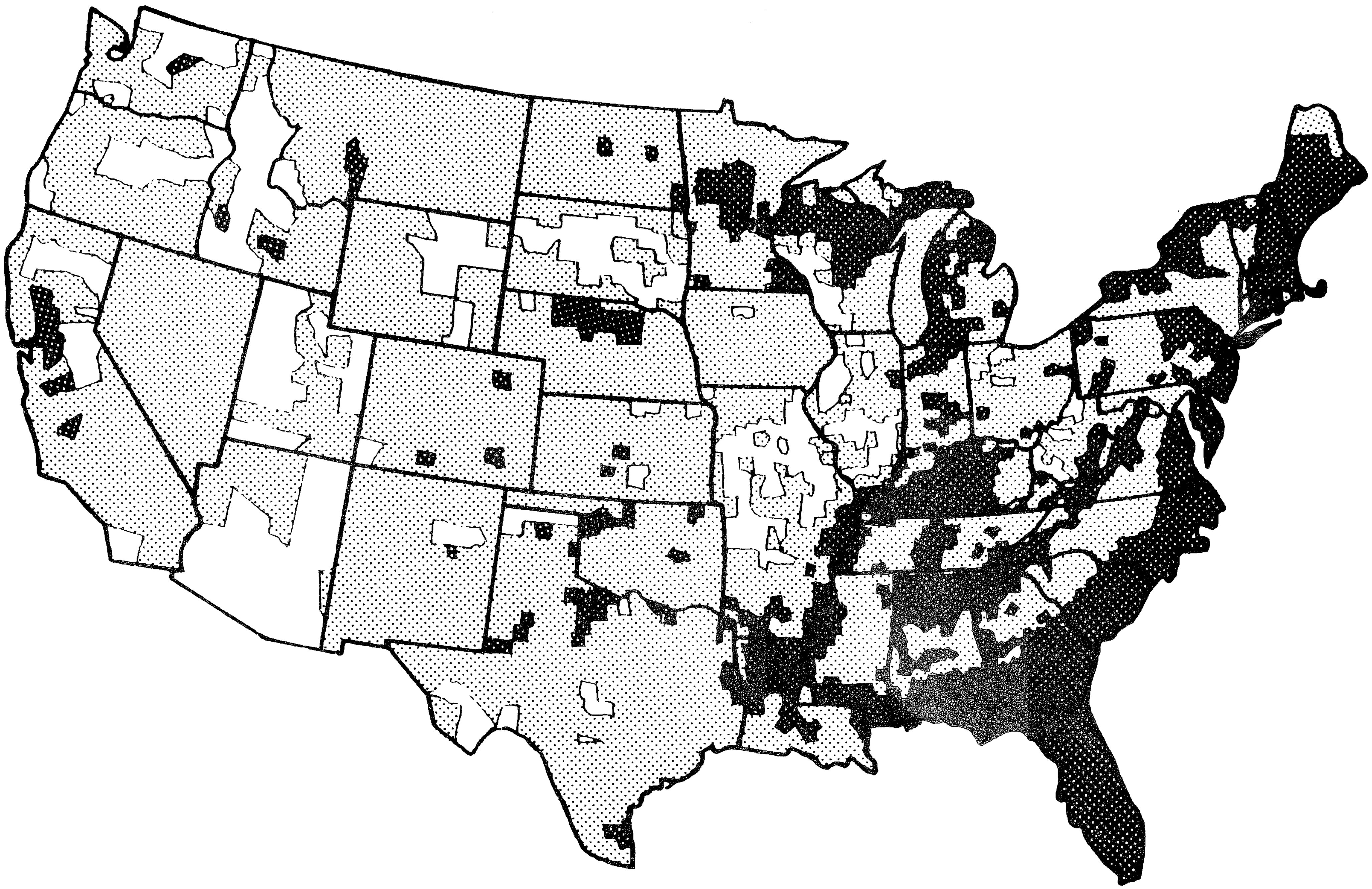
- application rates: how much pesticide is applied has a direct effect on the amount of pesticide available for leaching.

- timing of application: when a pesticide is applied in relation to rainfall events, season of the year, or presence of crop cover can be a major factor.

- method of application: pesticides can be applied as foliar sprays to standing crops or sprayed directly on bare soil, by dissolution in irrigation water, or by direct injection beneath the soil surface.

Figure I-6

Categories of Ground–Water Vulnerability; Coterminous United States



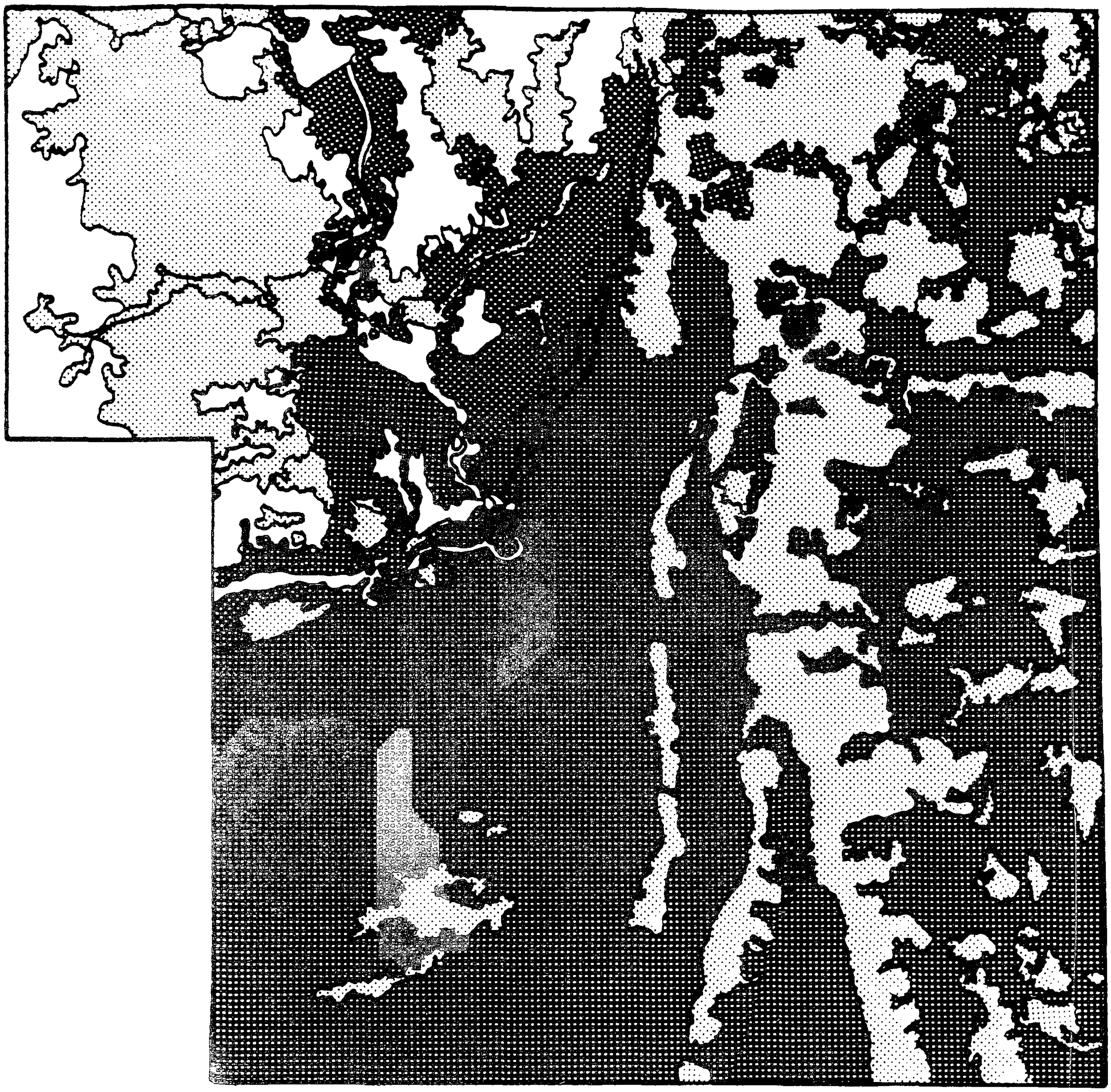
EXPLANATION

- High vulnerability coutry–based on VARSCORE ≥ 143
- Moderate vulnerability country–based on 102 ≤ VARSCOPE ≤ 142
- Low vulnerability country–based on VARSCORE ≤ 101

Figure I-7

Map of Ground Water Pollution Potential Portage County, Wisconsin

Prepared by: National Water Well Association



LEGEND	
DRASTIC VARSCORE Range	Color
80 - 119	☐ (white)
120 - 179	(light stipple)
> 179	(dark stipple)

DRAFT PROPOSAL

Direct injection or soil incorporation of surface-applied pesticides pose the highest potential for ground-water contamination.

- cultivation practices: conservation tillage practices used to decrease soil erosion can increase water infiltration and concomitant leaching of soluble pesticides. These practices also often require increased use of herbicides.

- spillage and disposal: as discussed earlier, spills can result in high concentrations of pesticides in soil which can overwhelm decomposition and adsorption capabilities. Spillage can be a common problem where pesticide mixing and loading activities take place. Handling of empty containers and rinsate from cleaning spray equipment may also result in high localized concentrations of pesticides in soil.

- irrigation: soils under irrigation are highly permeable, and the amount of irrigation water commonly reaching subsurface soil is estimated to be 20 - 40% of the applied water. Irrigation practices, thus, have the potential to dissolve and increase the potential for soluble pesticides to leach ground water.

- chemigation: in this practice, pesticides are applied to the field by addition to irrigated waters. When the water comes from a well, decreases in water pressure can result in back-siphoning of the chemicals down the well if check valves preventing reverse flow are not installed.

For any specific location where pesticides are used, factors in the above four areas determine the potential for ground-water contamination. Not only is the combination of factors very complex, but they are also very specific to each location and vary greatly across all agricultural regions. Technical expertise is needed to evaluate these factors and their combinations, as well as knowledge of the specific local conditions and circumstances.

CHAPTER 4
STATUTORY AUTHORITIES AND INSTITUTIONAL FRAMEWORK

A complex set of federal, state, and local laws authorize a wide variety of activities and programs that can be used to protect ground water from pesticide contamination. Many of these laws were written before pesticide contamination of ground water became a concern and subsequently have been broadly interpreted and expanded to cover this issue. Moreover these laws sometimes provide conflicting direction regarding how the pesticides in ground-water concern should be managed.

1. Federal Level

At the federal level, the primary agencies which have jurisdiction over pesticides in ground water are the U.S. Environmental Protection Agency (EPA), the U.S. Department of Agriculture (USDA), and the U.S. Department of Interior (DOI). The U.S. Geological Survey within DOI has the principal role for gathering hydrogeologic information on, and assessing the quality of, the nation's aquifers. Through a number of Federal-state cooperative programs, USGS and cooperative states compile information for planning, developing and managing the nation's water resources.

A second key player at the Federal level is the USDA. Through its Extension Service, Soil Conservation Service, Agricultural Stabilization and Conservation Service, and Agricultural Research Service, the USDA provides technical assistance to individual landowners and a range of incentives that can affect the way landowners choose to manage their land and water resources. Ultimately, landowners make choices regarding pesticide use and agricultural practices at their specific sites. Agencies, such as those found in USDA, which advise landowners play a significant role in ensuring that landowners make environmentally sound decisions.

The third critical player at the Federal level is EPA. This agency has the lead responsibility for regulating pesticide use in the U.S. and for protecting the quality of the nation's ground water. Within EPA, several environmental statutes and programs address one or more discrete sources of ground-water contamination (Figure I-9).

- The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) authorizes the Agency to regulate the marketing and use of pesticides in the U.S. Before allowing a pesticide on the market, the Office of Pesticide Programs weighs the risks of a pesticide against its benefits. Manufacturers must submit extensive data to EPA, including environmental fate data which will indicate the leaching potential of a pesticide.

- The Safe Drinking Water Act (SWDA) is designed to ensure that public water systems provide water meeting minimum standards for protection of public health. As required by the Act, EPA establishes drinking water standards (Maximum Contaminant Levels) and water supply monitoring requirements for public water supplies to meet.

  Under recent amendments to the Act, the Agency has been authorized to provide resources to states to establish "Wellhead Protection Areas" (WHPA) for public drinking water wells. Other recent amendments restrict underground injection of hazardous waste and establish a sole source aquifer demonstration program.

- Clean Water Act (CWA). The basic mission of the CWA is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. EPA provides grants to states for development and implementation of state ground-water protection strategies. Under the CWA's nonpoint source authorities, EPA also provides financial assistance to states for nonpoint source monitoring/assessments, planning, program development, and demonstration projects.

- The Resource Conservation and Recovery Act (RCRA) regulates disposal of waste, including pesticides, which may create a hazard. Pesticide-containing wastes that are considered hazardous wastes under RCRA are subject to extensive regulatory requirements governing storage, transportation, treatment, and disposal.

- The Comprehensive Environmental Response, Compensation and Recovery Act (CERCLA) establishes a trust fund (Superfund) to finance government responses to releases or threats of releases of hazardous substances. However, if ground-water contamination results from normal application of pesticides, the law does not allow the Agency to recover costs from pesticide applicators or private users.

Figure I-8

EPA Offices Working to Protect Ground Water

2. State Level

States have traditionally been responsible for implementing and enforcing Federal policies and standards. With the assistance of CWA grants, practically all states are now developing and implementing ground-water protection strategies addressing various sources of contamination, including pesticides. While many states have at least some activities addressing pesticide contamination, only a few have begun efforts that could be defined as prevention programs. Several states have established or are developing regulatory programs to require safety measures on chemigation systems and requirements for pesticide mixing-loading and storage areas.

A few states are preparing for or have passed legislation aimed at protecting ground water from contamination. In addition, many states have initiated ground-water monitoring programs and have identified areas where pesticide contamination of ground water is a problem.

State efforts to address the pesticides in ground water concern have some of the same coordination problems that the Federal government has. Often, the agency responsible for pesticides control is housed in the state agricultural department, while primary responsibility for water quality and waste disposal programs is located in a state environmental protection agency. Responsibility for ensuring safe drinking water often rests in still another agency, such as a public health department. This fragmentation of responsibilities among various agencies makes it difficult to establish an effective Federal-State relationship.

3. Local Level

The U.S. has more than 91,000 units of local government which by and large operate under state control. The local governments are the first point of contact for controlling contamination of ground water. Through their land use and zoning powers, local governments can also closely influence ground-water use and quality.

In summary, protection of ground water from pesticide contamination will require a coordinated approach among a number of agencies at each level of government. Development of a national EPA strategy is one of the first steps needed in moving toward an integrated and successful management approach.

CHAPTER 5
CONCLUSION

The significant findings of this problem assessment are as follows:

1. Ground water is a valuable national resource; however its value and use varies greatly across the country.

2. Ground water is vulnerable to contamination by normal use of pesticides as well as from leaks, spills and improper disposal.

3. Although the exact extent of the problem of pesticides in ground water is not known, enough information has been reported to indicate that the problem is widespread.

4. While ground-water contamination by pesticides usually occurs at very low levels, significant levels have been found in some areas and have resulted in numerous well closings. Health and environmental risks associated with pesticides in ground water are a function of toxicity and exposure. The true magnitude of the problem is unclear at this time and may not be known for several years.

5. Once widespread contamination of ground water by pesticides has occurred, it will often be infeasible to clean-up. Even provisions of alternative water supplies or adequate treatment may be impractical if contamination is widespread. For these reasons, prevention of contamination must be the focus of protection efforts.

6. The potential for ground-water contamination by pesticides is determined by a complex set of factors which vary considerably from area to area. Understanding these factors is essential for designing an effective prevention strategy.

7. The highly variable characteristics of the ground-water resource and the site-specific nature of the ground-water problem demand a more localized approach for managing protection efforts.

8. The number and complexity of Federal and state programs and statutory authorities which may be used to address the pesticides in ground water concern is substantial. Protection of ground water from pesticide contamination will require a coordinated approach among Federal agencies and with the states.

BIBLIOGRAPHY

The following references were consulted in preparing this Problem Assessment:

Cohen, S.Z., S.M. Creeger, R.F. Carsel, and C.G. Enfield, Potential Pesticide Contamination of Groundwater from Agricultural Uses (American Chemical Society Symposium Series No. 259, 1984)

The Conservation Foundation, Groundwater: Saving the Unseen Resource and A Guide to Groundwater Pollution: Problems, Causes, and Government Responses, (Washington DC 1987)

Freeze, R.A., and J.A. Cherry, Groundwater (Prentice-Hall, Inc., Englewood Cliffs, NJ. 1979)

Office of Technology Assessment, US Congress, Protecting the Nation's Groundwater from Contamination (Washington DC, 1984)

Neilsen, Elizabeth G. and Linda K. Lee, The Magnitude and Costs of Groundwater Contamination from Agricultural Chemicals (USDA, 1987).

Pye, V.I., R. Patrick, and J. Quarles, Groundwater Contamination in the United States (University of Pennsylvania Press, Philadelphia, 1983)

US Environmental Protection Agency, Office of Research and Development, DRASTIC: A Standardized System for Evaluating Ground-Water Pollution Potential Using Hydrogeological Settings (EPA, 1985)

US Environmental Protection Agency, Office of Ground-Water Protection, Pesticides in Ground Water: A Background Document (EPA, 1986)

US Environmental Protection Agency, Office of Ground-Water Protection, Improved Protection of Water Resources from Long-Term and Cumulative Pollution; Prevention of Ground-Water Contamination in the United States (EPA, 1987)

US Geological Survey, National Water Supply Summary 1984 (USGS Water Supply Paper 2275, US Government Printing Office, 1985)

PART II

PESTICIDE STRATEGY

Pesticide Strategy

PART II
PESTICIDE STRATEGY

The purpose of this strategy is to articulate EPA's proposed long-term approach for managing the pesticides in ground water concern. The strategy is divided into three chapters (Figure II-1):

- Environmental Goal
- Prevention Policy and Program
- Response Policy and Program

In the first chapter, the Agency defines its environmental goal in terms of what waters to protect and the criteria for determining protection. The resolution of these issues is a prerequisite for establishing policies for both prevention and response efforts.

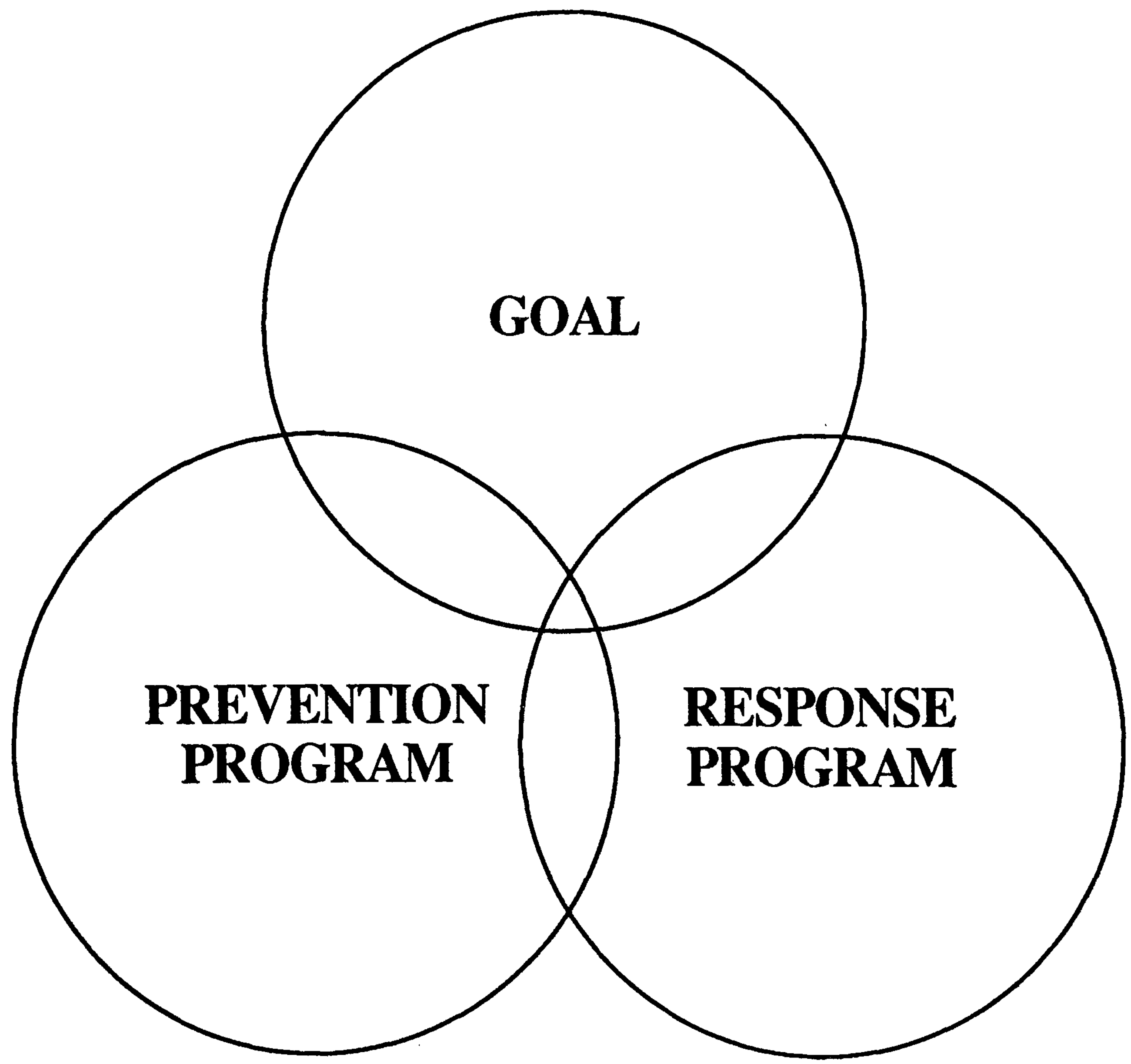
The second chapter presents the Agency's strategy for preventing contamination and focuses on the key issues of how to address local variability and the appropriate federal/state roles and responsibilities in managing the problem. In defining its prevention policy and program, the Agency has examined options available, not only under its basic pesticide law, but also under other environmental authorities and the authorities of other federal agencies as well as state capabilities.

The final chapter of the pesticide strategy establishes the overall framework for responding to ground-water contamination that has already occurred. Here again the critical question is the appropriate federal and state roles and responsibilities.

For each of these chapters, the document will first highlight the options and the factors which the Agency considered in formulating its strategic approach. The second section of each chapter will present EPA's proposed approach and specific positions on a number of key issues.

Figure II-1

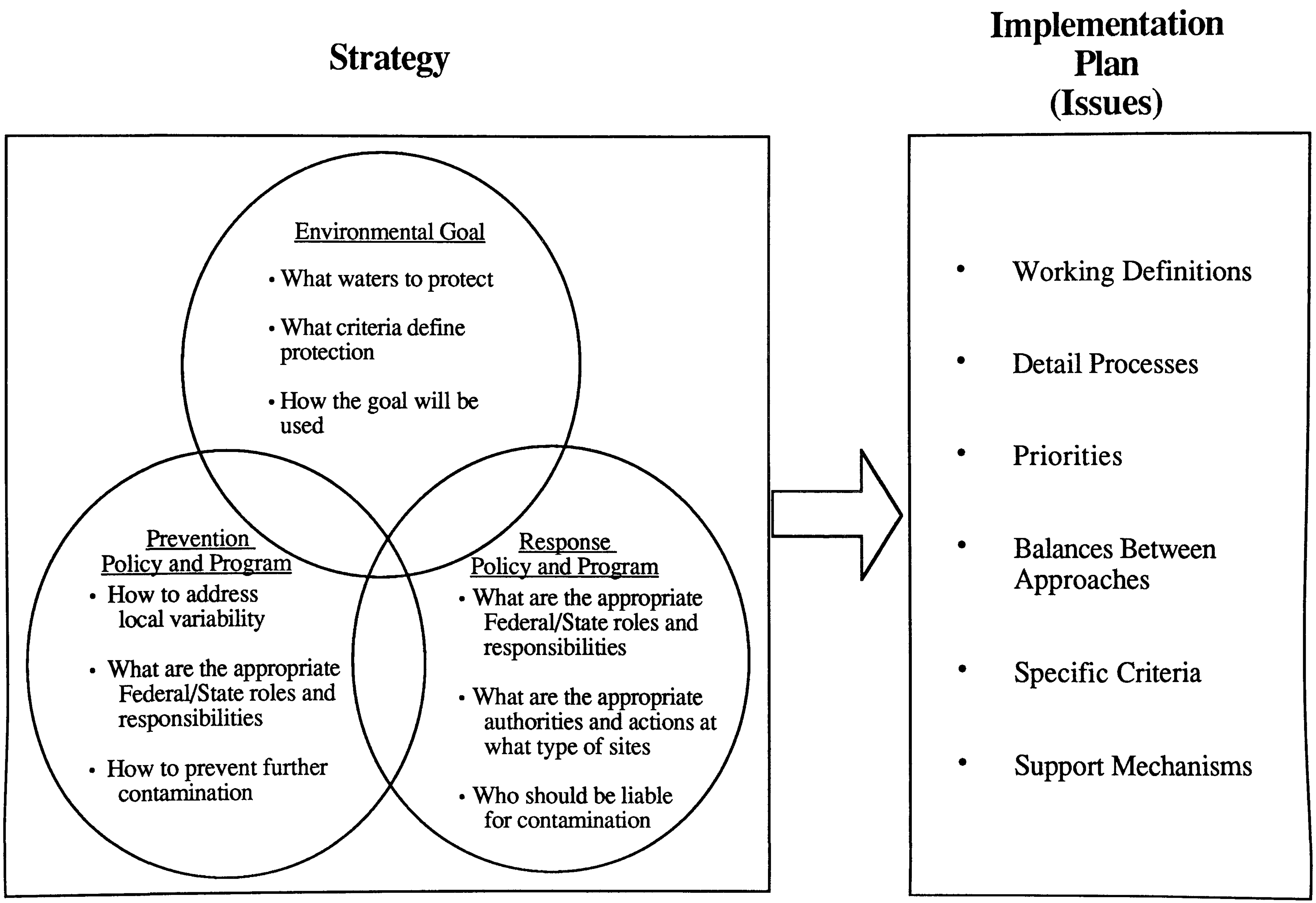
Pesticide Strategy



The policies presented in these three chapters form EPA's proposed pesticides in ground water strategy. It is important to note that a number of key implementation issues are associated with this strategic approach. These issues are summarized in the final part of this document. The next major step in the planning process (Figure II-2) is to seek extensive input on these particular issues from state agencies, other federal agencies, and other parties who will have key roles in the successful implementation of this strategy. After receiving public input on the proposed strategy and implementation issues, EPA will develop a detailed implementation plan - the final step in the process.

Figure II-2

Pesticides in Ground Water Strategy



Pesticide Strategy

CHAPTER 1
ENVIRONMENTAL GOAL

EPA's proposed environmental goal will be to manage the use of pesticides within a ground water classification framework in order to protect the ground-water resource. The Agency will give specific attention to preventing unacceptable contamination of current and potential drinking water supplies and will use MCLs or other EPA-designated criteria as its point-of-reference for both prevention and response decisions when addressing pesticides in ground-water concerns. This environmental goal will be used as a benchmark to:

- Identify and evaluate if, and where, the problem exists;
- Establish priorities to focus both prevention and response efforts;
- Select the most appropriate control measures; and
- Assess progress in preventing the problem or responding to existing threats.

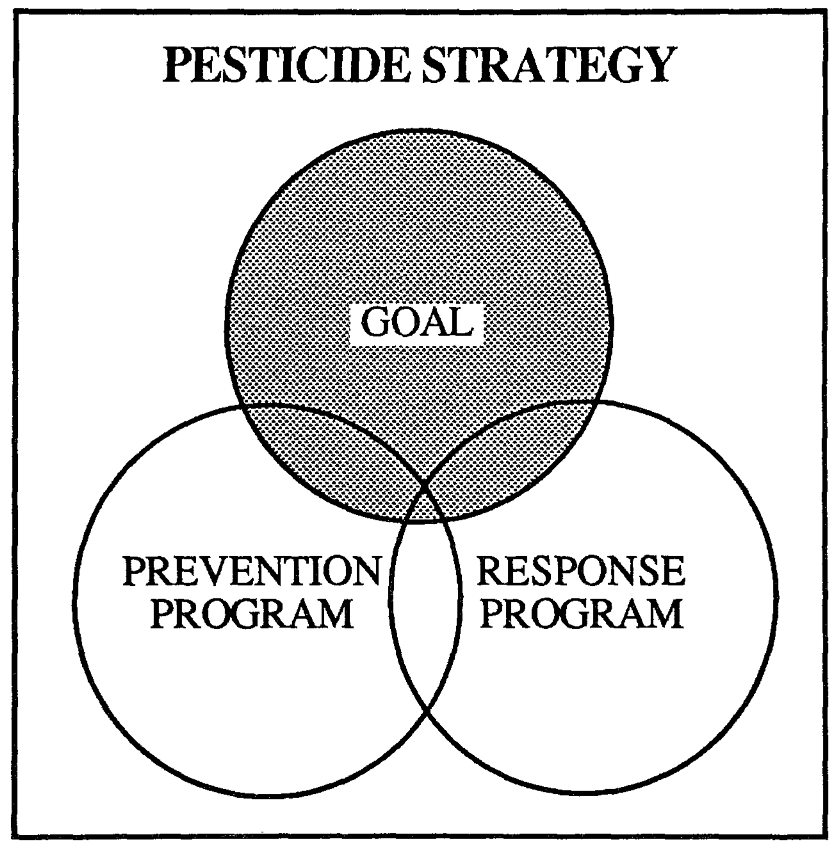
Below is a discussion of the options and factors which the Agency considered in developing its goal for the pesticides in ground water strategy. Following this section is a presentation of the Agency's proposed position on the key issues underlying the environmental goal.

SECTION 1: OPTIONS AND FACTORS CONSIDERED

The two key questions which the Agency has addressed in defining its environmental goal for pesticides in ground water are: (1) what waters to protect and (2) what criteria determine protection (Figure II-3). The Agency has addressed these questions within the context of its regulatory statutes and other Agency policies, including its basic policies for pesticide registration.

In 1984, EPA issued the EPA Ground-Water Protection Strategy (GWPS) after many years of internal debate and external review and comment. The Strategy sets out goals and objectives for the Agency's ground-water protection efforts.

Figure II-3



Goal Definition Issues:

- What Waters to Protect
- What Criteria Determine Protection

In the GWPS EPA established the policy of protecting the ground-water resource to ensure its quality for the highest present or potential beneficial use. The highest beneficial use is defined as drinking water.

The GWPS also developed a general policy for classifying ground waters based on their use, value, and vulnerability. Dividing ground water into three classes, this policy provides an extra degree of protection to ground water that is highly vulnerable to contamination and is of great value because of its importance as a source of drinking water or its contribution to a unique ecological habitat (Class I). The majority of the nation's ground water is in Class II, a current or potential source of drinking water, and it is for this ground water that basic EPA ground-water protection requirements are designed, e.g., protection to a drinking water standard or better if feasible. Class III ground water is not a potential source of drinking water due to levels of contamination from naturally occurring conditions or the effects of broadscale human activity.

The strategy proposed in this document affirms the intended extension of EPA's basic ground-water policies to the Agency's efforts to protect ground water from pesticide contamination. A number of policy issues and options, already addressed under the GWPS, are presented here with options primarily for those who may not be familiar with the Agency's basic ground-water policies.

In developing the strategic approach for pesticides in ground water, EPA considered several aspects of this overall Agency policy for ground-water protection to determine the extent to which they were appropriate for the pesticides effort. Alternative approaches, such as approaches that would protect only ground water currently supplying a drinking water well or that would rely on treatment at the tap as the means for protecting public health, were rejected as inadequate for protecting the ground-water resource for present and future generations. The Agency concluded that while the unique needs of agriculture must be accommodated in the strategic approach for pesticides, the basic policy of protecting the ground-water resource itself and focusing efforts on current and potential sources of drinking water would be the appropriate framework. The differential approach in the EPA

Ground-Water Protection Strategy allows management strategies to be tailored to ground waters of varying use, value, and vulnerability while ensuring protection of all ground water that is a current or potential drinking water supply.

The following discussion outlines the factors and options which EPA considered in determining its environmental goal for addressing the pesticides in ground water concern.

1. What Waters to Protect

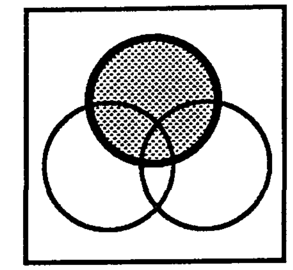
Ground waters vary greatly in how they are used and in their value to society. For example, in some areas, ground water may provide an irreplaceable source of drinking water to a large population, while in other areas, ground water may not be usable as a drinking water source because of its high salinity or its low yield. Other ground water, that may or may not be a drinking water source, could be valued for its importance to an area's fragile ecosystems.

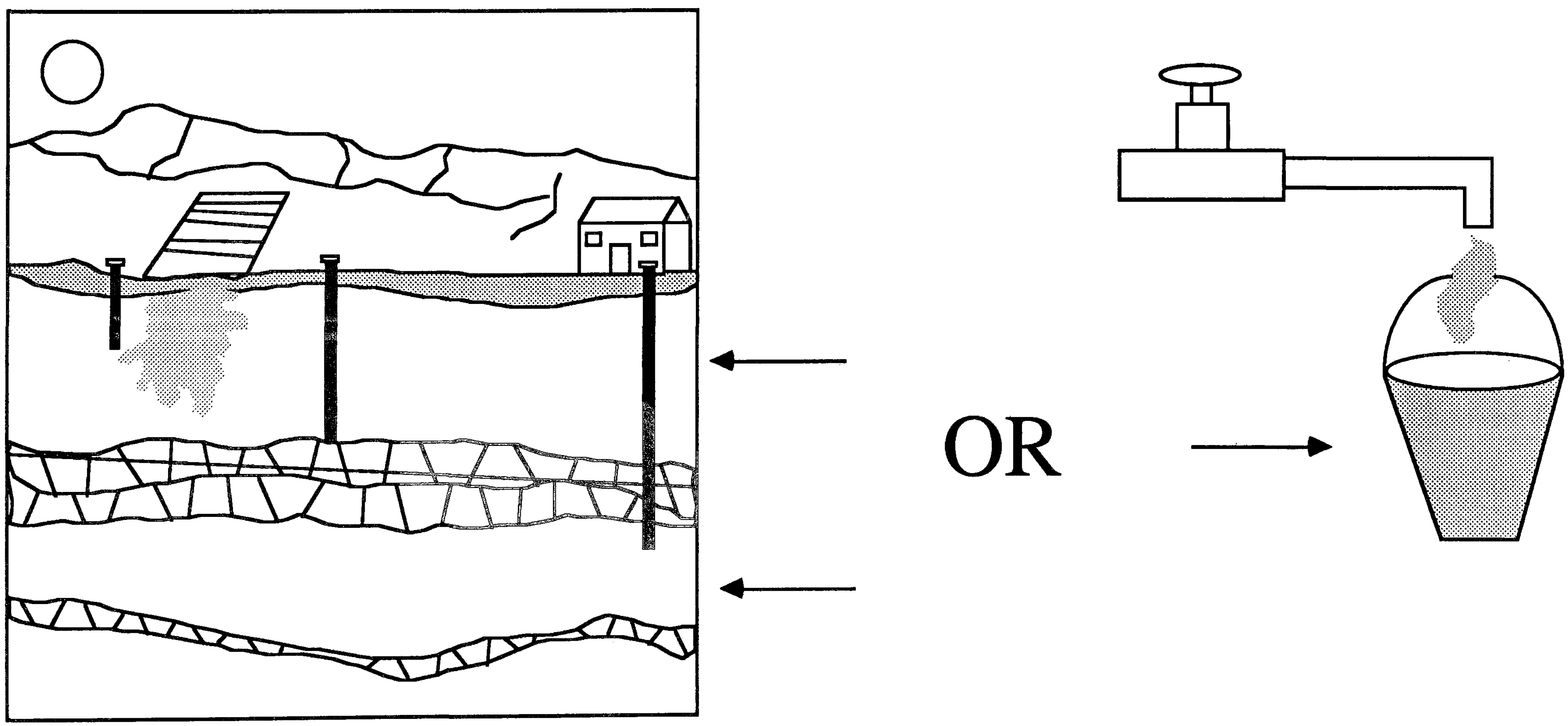
The first issue in determining what waters to protect is whether protection efforts should be focused on assuring the quality of the ground-water resource or the quality of water actually delivered to the tap for drinking (Figure II-4). The difference between these two options is that the latter choice could allow for the contamination of ground water in areas where there is adequate treatment capability for reducing contamination to acceptable levels before it is provided for drinking.

A second key decision for the Agency is to determine whether to spread its protection efforts widely to protect all ground waters or to narrow its protection focus on some selected waters that provide more valuable use. If the Agency focuses its efforts on assuring that safe drinking water is provided, it would have to decide whether to protect private wells to the same extent as public water systems. If the Agency chooses to protect water in the

Figure II-4

What Waters to Protect





In-ground Supplies

Tap Water

ground, then the Agency has a number of options, based upon the different degrees of use and value of ground water (see Figure II-5), including:

- **Protection for All Ground Water** - One option is to protect all ground water as it exists in the saturated zone regardless of its current or potential use as a drinking water source. (As seen in Figure II-6, the saturated zone lies below the unsaturated zone, which is the first zone of water and soil below the surface layer).

- **Protection for All Ground-Water Resources That Are Current or Potential Drinking Water Sources or of Ecological Importance** - This option would also protect the ground water in the saturated zone, but would limit protection to those ground-water resources that are currently or potentially available for drinking water. A key consideration in implementing this option would be defining potential drinking water.

- **Protection for Only that Ground Water Currently Used as a Drinking Water Source** - This option would limit protection to those ground-water resources that currently supply drinking water. A key implementation issue would be defining what ground water actually supplies a drinking water well.

- **Protection for that Only Ground Water Supplying Public Drinking Water Systems** - This option is similar to the previous one except that protection is limited to those ground waters that supply public water systems. Again, a key implementation issue would be deciding what ground water actually supplies these drinking water wells.

- **Differential Protection for Different Waters** - With this option, all ground waters would be considered for protection, but priorities and stringency of prevention and response efforts would be based on the relative use and value of the ground water. For example, basic protection efforts could be provided for ground waters that are a current source of drinking water. Higher degrees of protection could be provided to ground waters that serve large populations. On a case-by-case basis, some ground waters that are not a drinking water source could be afforded less protection where conditions warranted such actions.

With regard to what waters to protect, EPA's legislative priorities provide somewhat different direction. The major relevant EPA statutes which address this question include:

- <u>**Federal Insecticide, Fungicide, and Rodenticide Act**</u> **(FIFRA)** - The basic pesticide law, FIFRA does not specifically identify ground water as an environmental medium requiring protection. However, EPA recognizes that the public may be exposed to pesticides in drinking water as a result of contaminated ground water, and thus, the ground-water medium is included in EPA's interpretation of FIFRA's general

Figure II-5

What Waters to Target for Protection

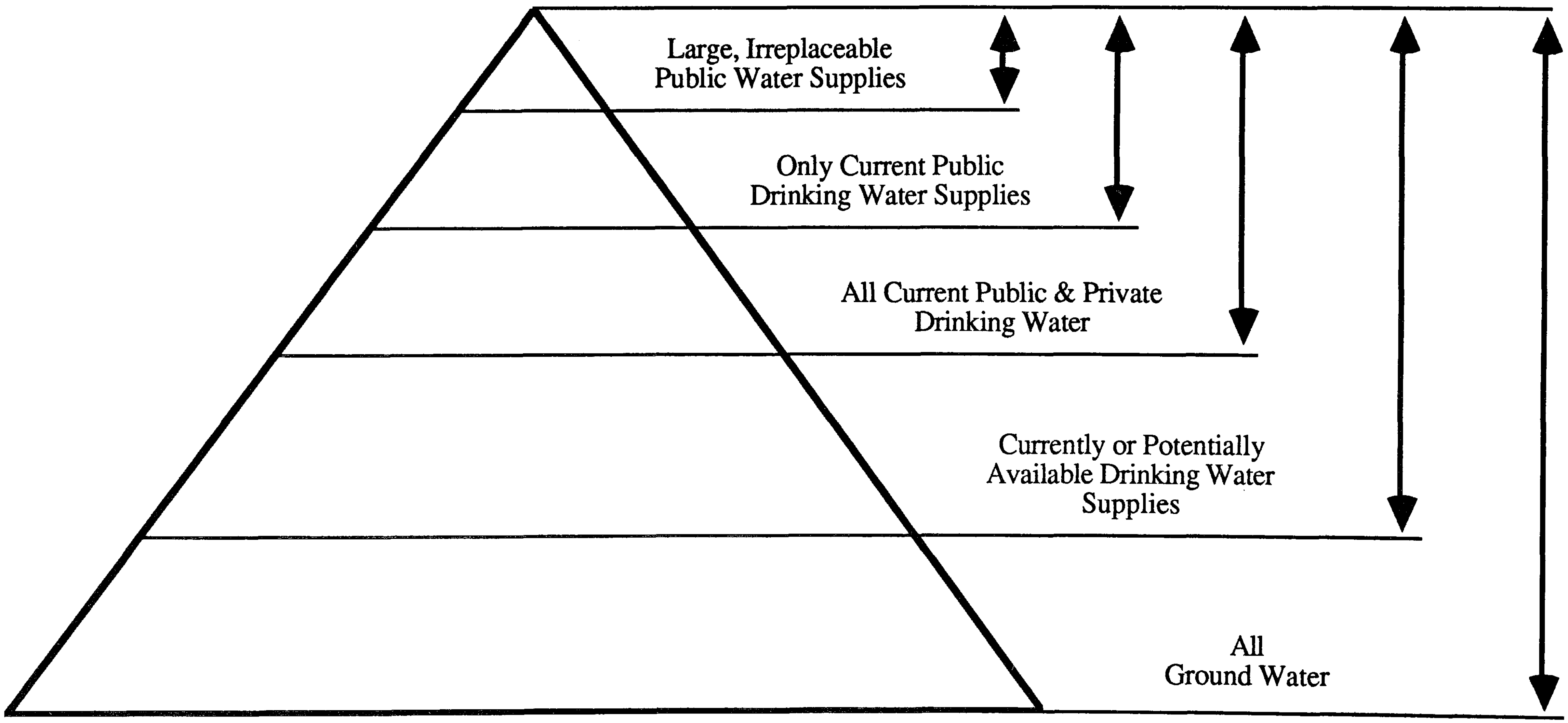
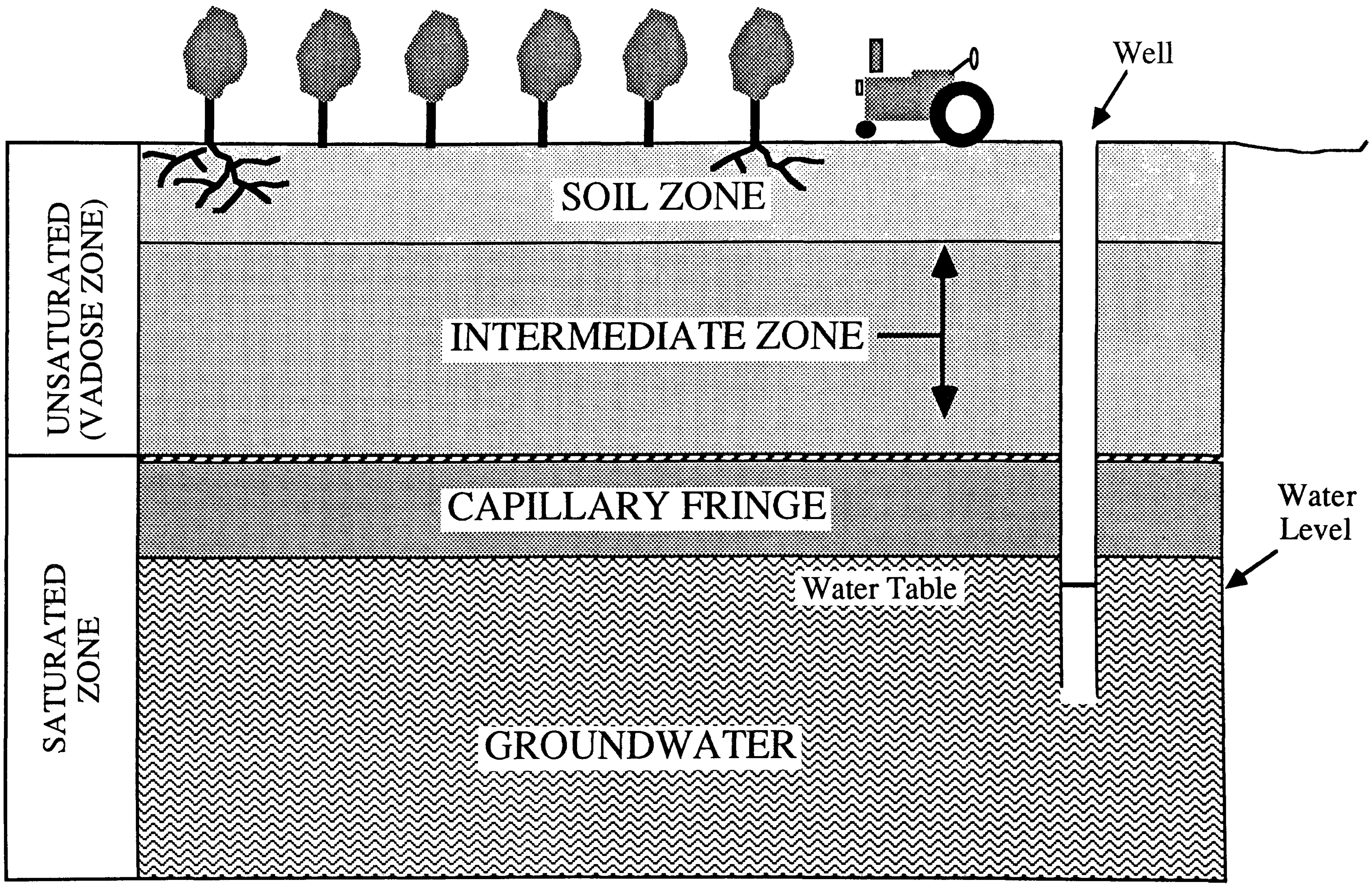


Figure II-6

Zones of Subsurface Water



requirement for protection of the environment. In addition, several recently proposed bills to amend FIFRA mandate a differential protection approach requiring special protective measures for ground waters that are a current or potential source of drinking water.

- **Safe Drinking Water Act (SDWA)** - Federally-enforceable drinking water standards under the SDWA are limited to the drinking water that is provided by public water systems, i.e., those systems having at least fifteen service connections or serving at least 25 persons daily. If the question of what waters to protect is limited to those waters covered by these SDWA drinking water standards, then individual private wells, which are often found in rural areas and are most at risk from pesticide contamination, would be largely unprotected. (Note - some states do take action for private wells based on these SDWA drinking water standards.)

  Another important factor to consider is that these SDWA drinking water standards, which apply to public water systems, do not apply to the ambient or raw water used by these systems unless it is provided directly to the public. The public system can treat or blend its water, however, to meet SDWA drinking water standards before delivering it to the user.

  The 1986 amendments to the SDWA, established the Wellhead Protection Program which, unlike previous SDWA measures, is designed to protect ambient ground waters, but the focus remains on public water systems and has no federally-enforceable quality standards.

- **Clean Water Act (CWA)** - As amended by the Water Quality Act of 1987 (WQA), the CWA does not differentiate ground water in terms of its protection goal of restoring and maintaining the integrity of the Nation's waters.

- **Resource Conservation and Recovery Act (RCRA)** - As amended by the Hazardous and Solid Waste Amendment of 1984 (HWSA), RCRA identifies ground water as a specific medium for protection and requires ground-water monitoring at hazardous waste facilities.

- **Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or "Superfund")** - As amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), CERCLA establishes criteria for determining response priorities among releases or threatened releases of hazardous substances. The potential for a release to contaminate a drinking water supply is a major CERCLA criterion. Under CERCLA, a drinking water supply is defined as being "any raw or finished water source that is or may be used by a public water system (as defined by SDWA) or as drinking water by one or more individuals", which would include private wells.

In summary, EPA's various legislative statutes provide a range of guidance on what ground waters to protect (Figure II-7). In some of EPA's existing

Figure II-7

Goal: Varied Legislative Direction

FIFRA/TSCA

- All Environmental Concerns
- No Unreasonable Risk

SDWA

- Public Drinking Water Systems
- No Adverse Health Effects with Adequate Margin of Safety; Standards Also Based on Feasibility

GOAL

RCRA

- Promote the Protection of the Public and the Environment
- MCL, Background, or "Alternative Concentration Limit"; also "No Migration" for Land-Banned Chemicals

CERCLA/SARA

- Protect Public Health and Welfare; and the Environment -- High Priority for Public Drinking Water Systems
- Applicable or Relevant and Appropriate Requirements

CWA

- Nation's Water (Sec. 304: "restore and maintain. . . ground waters. . .")
- Restore Integrity
  No Toxic Discharge

statutes, ground water is not specifically mentioned, while in others EPA's enforceable authorities are limited to ensuring that the quality of drinking water supplied by public water systems is adequate.

In addition to these legislative considerations, the Agency also considered its existing policies in addressing the question of what waters to protect. In this regard, the Agency's basic ground-water policy states that the ground-water resource will be protected to ensure quality for the highest present or potential beneficial use. The highest beneficial use is defined as drinking water. The Agency's basic policy is also based on differential protection in regard to the use, value, and vulnerability of ground waters.

2. What Criteria Determine Protection

The second key part of the Agency's goal is identifying the criteria to be used for determining protection. Again, the Agency's legislative authorities provide varying guidance for addressing this issue (Figure II-7).

- **Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)** - This basic pesticide law requires the Agency to weigh the health and environmental risks of the use of each pesticide against the benefits of such use. Those pesticide uses which are found not to present an unreasonable risk may be registered.

- **Safe Drinking Water Act (SDWA)** - In contrast to FIFRA, the SDWA does not require considerations of the benefits of any regulated chemicals, including pesticides. Rather, the SDWA establishes a goal of protecting public health from exposures to contaminated public water supplies. SDWA standards are set as close as possible to those goals but must take into account the cost and availability of feasible treatment technology to reduce contamination of water delivered to the consumer.

- **Clean Water Act (CWA)** - The stated goal of the CWA is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. EPA has established human health protection criteria for pesticides in edible fish tissue based on levels that provide negligible or no significant risks.

- **Resource Conservation and Recovery Act (RCRA)** - Under RCRA, the contamination of ground water by hazardous waste facilities cannot exceed standards based on background environmental levels, SDWA standards, or levels that would pose a substantial present or potential hazard to human health or the environment. Of particular note, RCRA does provide EPA more flexibility in establishing protection criteria for releases from non-hazardous waste facilities, such as municipal landfills.

- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) - CERCLA or "Superfund" must be considered when responding to existing contamination. As amended by SARA in 1986, CERCLA now requires that clean-up levels (i.e., protection criteria) be defined in terms of applicable or relevant and appropriate regulatory requirements of other environmental statutes, such as the SDWA and CWA.

To date, the Agency has discussed the question of what criteria to use for ground-water protection mainly in relationship to the regulation of waste sites. This discussion has focused on both the differences within a statute (i.e., RCRA requirements for hazardous waste facilities versus non-hazardous waste facilities), as well as between statutes (i.e., RCRA versus CERCLA). When pesticides are considered in this discussion, the extent of the differences in legislative direction becomes even more pronounced.

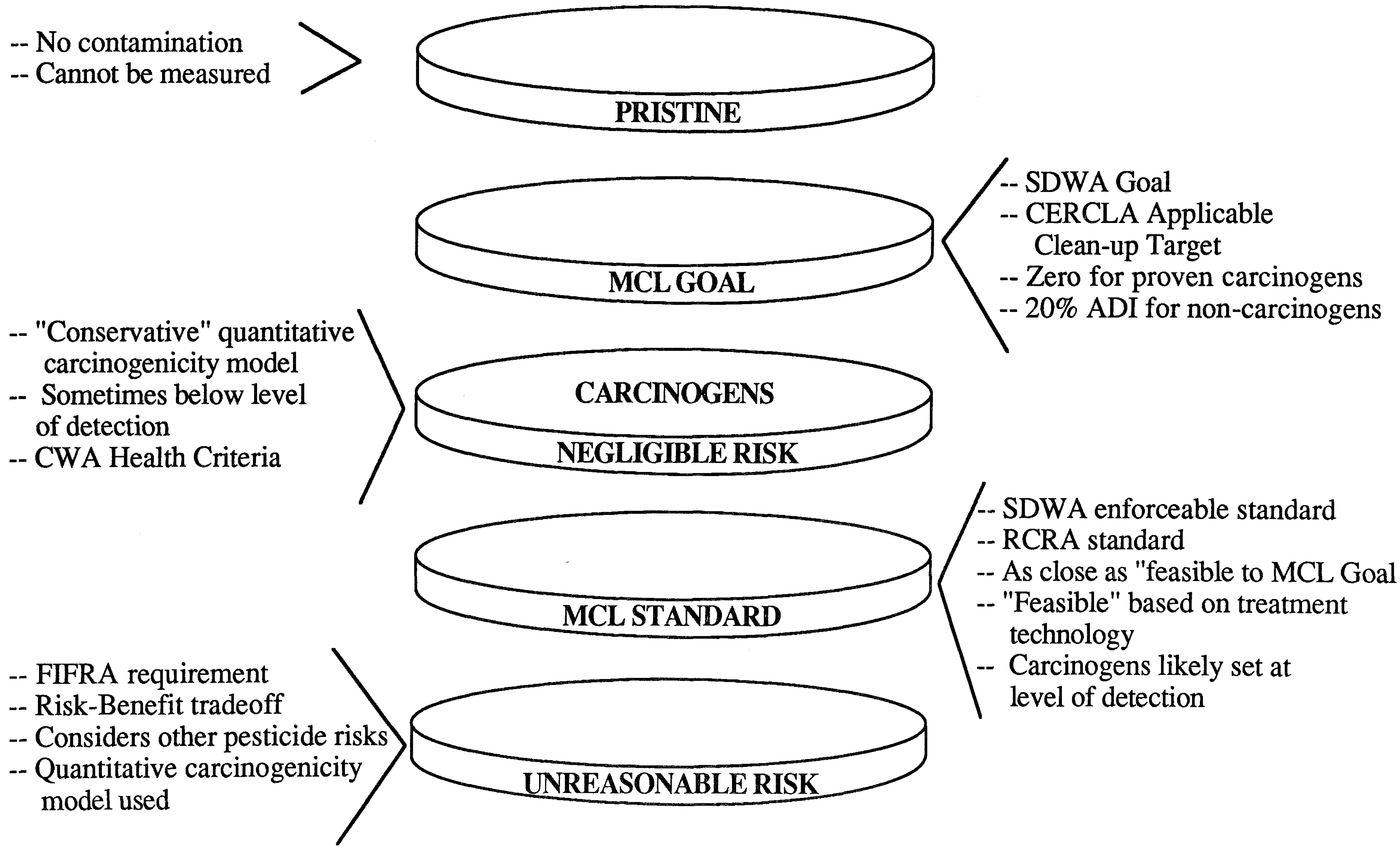
As described above, FIFRA requires the Agency to consider the benefits of a pesticide as well as its risks. Those risks considered reasonable under FIFRA's mandate may not be consistent with the regulatory policies established under other environmental statutes. The potential for this discrepancy is perhaps greater for ground water than for other pesticide concerns due to the number of relevant statutes.

The options which EPA considered for the criteria for defining protection are shown in Figure II-8 and include:

a) **PRISTINE** - Protection criteria based on pristine conditions would require prevention efforts that are designed to achieve zero contamination in waters chosen for protection. With this option, response efforts would have to restore protected ground waters to zero contamination levels. While an unspoiled environment is desirable, there are a number of practical barriers to achieving such a goal. First of all, zero is not scientifically measurable and therefore not attainable. Secondly, efforts to attain pristine ground water would be enormously expensive and would limit greatly the type of waters that could be targeted for such protection.

Figure II-8

Basic Protection Criteria Options



b) **MAXIMUM CONTAMINANT LEVEL GOAL (MCLG)** - The SDWA requires the Agency to set a Maximum Contaminant Level Goal (MCLG) for any potential drinking water pollutant at a level that has no known or anticipated adverse effect. EPA's policy has been to set the MCLG at absolute zero for a chemical proven to be carcinogenic (cancer-causing) in humans, or a probable carcinogen in animal studies. For noncarcinogens, the MCLG is set at a level corresponding to a percentage of the Acceptable Daily Intake (ADI) or more recently, Reference Dose (RfD).[1/]

In developing the MCLG policy, EPA considered setting the MCLGs for carcinogens at the lowest levels that could be detected by modern analytical technology (the limits of detection). The Agency also considered setting MCLGs at levels that would pose insignificant or negligible risks (see below). The Agency's most compelling argument for choosing the more conservative option of absolute zero for probable carcinogens is that the MCLG was not intended to be used as a practical regulatory standard, but rather as a statement of the SDWA program's general long-term aim.

Where the concern is for a carcinogenic pesticide in ground water, the use of the MCLG as the protection criterion would have the same problems as the pristine option. In this case, a measurable goal could not be established because a zero level is not scientifically measurable. Furthermore, prevention and response efforts could constantly be in doubt as the ability to measure smaller and smaller levels of environmental contaminants progresses. Use of the MCLG as the criterion for protection could also skew public health and environmental priorities since this approach does not consider the relative potency of different carcinogens, nor does this

---

[1/] To simplify somewhat, the ADI is developed by first determining the concentration of a chemical that shows no observable toxic effect (NOEL) in animal tests. After factoring the size of humans and possible other biological differences, the NOEL is divided by a margin of safety factor, the magnitude of which is determined by the quality of the toxicology data and other factors. EPA uses a percent of the ADI for setting an MCLG because humans may be exposed to the chemical through other routes such as food.

approach consider that a non-carcinogen could pose a much greater risk than a weak carcinogen. Futhermore, as with the pristine option, the cost of protecting, monitoring and restoring ground water based on a zero level may limit greatly the type of waters that could be targeted for such protection.

c) **NEGLIGIBLE RISK** - EPA has applied the concept of negligible risk to carcinogens. Substances shown primarily through controlled animal studies to have the capacity to cause cancer (malignant tumors) are considered to be carcinogens. In assessing the risks of these substances, EPA assumes that there is no level of exposure that has a zero chance or risk of an adverse effect. However, the risks are assumed to be proportional to the level of exposure. Therefore, at some exposure level the risk posed by a carcinogen can be considered to be insignificant or negligible.

EPA uses a number of "worst case" assumptions to estimate the risks to humans from environmental exposures to carcinogens based on extrapolations from animal studies. If a "worst case" or "upper bound" estimate of cancer risk is one in a million (1×10^{-6}) or less, the risk at that level of exposure is generally considered to be insignificant or negligible.

The use of negligible risk as the basis for a protection criterion provides a level that is considered very protective of human health. Such a goal could be measurable, but for some chemicals, the concentration of a chemical at a negligible risk level may not be detectable. In this case, a decision would have to be made to accept the limits of detection as an acceptable level. Because of its stringency, a standard based on the concept of negligible risk may not be achievable as a clean-up standard for certain pesticide contamination incidents.

d) **MCL STANDARD** - Following the development of an MCLG, the SDWA requires EPA to establish a Maximum Contaminant Level (MCL) that is the enforceable standard used to guard the adequacy of the drinking water provided by public water systems. The SDWA requires EPA to set the MCL as close as possible to the MCLG, taking into account the cost and feasibility of measuring and reducing the contamination. MCLs are set in a range that is considered protective of human health.

MCLs as protection criteria have already been established for public water systems, and as such they can provide measurable goals. In some cases, though, MCL's may be difficult to achieve, particularly when they are used to protect private well water or the ground-water resource. Like the previous options, MCL's are not based on a consideration of the benefits of the contaminants to society.

e) **UNREASONABLE RISK** - As mentioned earlier, FIFRA is a risk-benefit statute and requires the weighing of the human health risks posed by a pesticide's use against its benefits. In some isolated cases, concentrations posing a non-negligible risk may be tolerated if the benefits of the pesticide's use are found to be uniquely critical.

The key question for the Agency is how to develop a goal for protecting ground water from pesticide contamination that is compatible with the requirements under each of its legislative mandates. From a prevention perspective, FIFRA requires the Agency to weigh the benefits of a pesticide's use against its risks. From a response perspective, actions are based on criteria (e.g. SDWA goals and standards) that do not consider the benefits of pesticide use. Obviously, EPA must attempt to prevent the creation of contamination problems that would require corrective actions, such as treatment by public water systems. The critical issue is whether the criteria used to define protection under other legislation can be used as the basis for unreasonable risk determinations under FIFRA.

SECTION 2: EPA'S PROPOSED POSITION

EPA's proposed environmental goal will be to protect the ground-water resource with the key focus on preventing contamination of current and potential drinking water supplies from reaching an MCL or other EPA-designated protection criteria. Specifically, the Agency will adopt the following policies for protecting ground water from pesticide contamination:

1. <u>The Agency will use a differential protection approach to protect the ground-water resource. With this approach, the Agency will apply baseline protective efforts primarily to those waters that are current or potential sources of drinking water or that are vital to fragile ecosystems (Figure II-9). Additional measures may be taken to ensure protection of certain "high priority ground waters"</u>.

Ground water provides nearly half of the drinking water used in this country. Regardless of whether that water is being provided through a community public water system or to a private individual, it is not usually monitored for the presence of pesticide residues, nor is it usually subject to any treatment technology capable of removing low, but possibly health significant levels of pesticides.

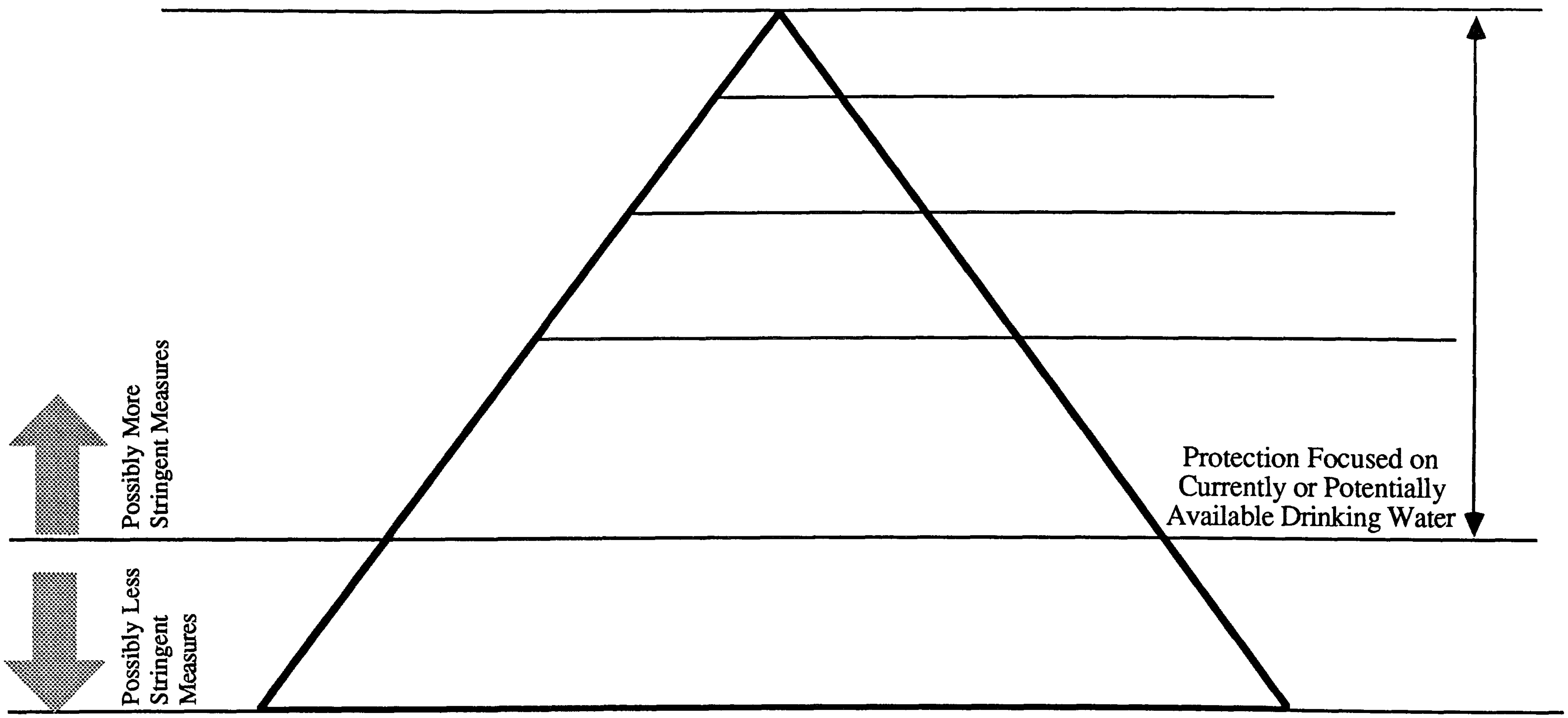
Under the SDWA, EPA is establishing standards which will require public drinking water systems to identify, and where necessary, to remove pesticide residues posing potential health concerns before supplying the water for use. However, it will take substantial time and investment for public systems to achieve this capability; these requirements also will not be applied to the approximately 12 million private wells that supply drinking water to millions of Americans. Thus, EPA must assume that contaminated ground waters which are used as a source of drinking water may result in direct human exposure. It is the Agency's position that protection of these ground waters is synonymous with public health protection. As such, EPA's protection efforts must target those ground-water resources that serve as drinking water sources.

Since the natural cleansing processes of ground waters can be extremely slow, contamination of this resource poses a potential hazard for future generations. Contaminated ground water could be used as a drinking water source before being tested for contamination. Where contamination is identified, efforts could be made to restore the ground water for use as a drinking water source, but this option could present insurmountable technological difficulties and exorbitant costs.

Figure II-9

What Waters to Target for Protection

EPA Policy:
Differential Protection Based on Use and Value
of the Ground Water Resource



In practice, alternative water sources or point-of-use treatment, if technology is available, may be the only viable preventive measures for a community. Although local governments could regulate the placement and construction of wells, there is the possibility that these ordinances may eventually be ignored or overlooked before the ground water has been cleansed by natural processes. For these reasons, EPA must assume that contaminated ground water that is a potential drinking water source could eventually result in human exposure. EPA's protection goal therefore includes ground-water resources that are potential as well as current sources of drinking water.

The need to protect the ground-water resource is further underscored by the fact that ground waters provide approximately 30% of the annual base flow to surface water systems. In certain dry areas of the country or during periods of drought, ground water flows to surface waters can have a more dominant role. As such, the continued existence of fragile ecosystems may depend on the quality of certain ground water. To meet its basic environmental protection mission, EPA must focus protection efforts on ground-water resources from an ecological perspective as well as from a public health concern.

As part of its differential protection approach, the Agency will take additional measures to protect "high priority ground water". These "high priority ground waters" may serve as irreplaceable sources of drinking water for sizable communities, or they may be vital to the continued survival of endangered species or critical ecosystems. For these situations, additional measures, beyond baseline protective efforts, may be required to provide further assurances that these, and perhaps other "high priority ground waters", are not contaminated or that they have priority for corrective actions, if already contaminated.

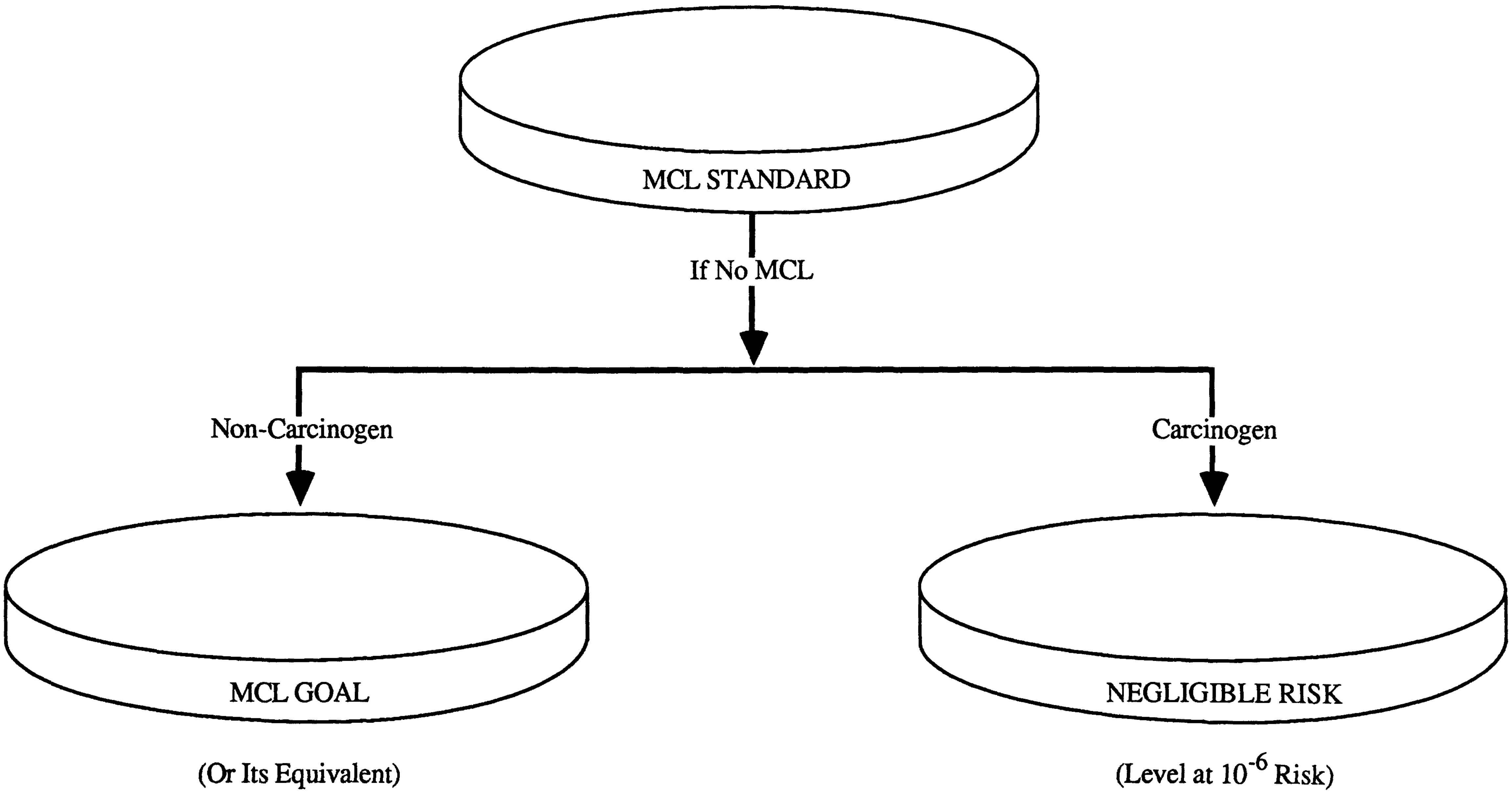
2. EPA will use MCLs, as defined under the SDWA, as its basic protection criteria. When no MCL exists, EPA will use the equivalent of an MCLG for non-carcinogenic pesticides and a negligible risk level for carcinogenic pesticides (Figure II-10). The Agency will also address any unreasonable risks to ecosystems.

Figure II-9

Figure II-10

What Criteria Determine Protection

EPA Policy:



The MCLs are the enforceable SDWA standards used to determine the adequacy of the drinking water provided to most of the population through public water systems. It is EPA's policy that this same level of protection should be the basic criterion for determining protection of all current and potential drinking water.

Under the 1986 SDWA Amendments, EPA is moving to establish new MCLs for potential drinking water contaminants, including a number of pesticides. In the interim, EPA will develop alternative ground-water protection criteria based on standard risk assessment procedures. For noncarcinogens, EPA will establish these interim protection criteria based on a No Observable Effect Level (NOEL) with appropriate margins of safety of two or three orders of magnitude depending on the confidence in the toxicity data and other risk assessment factors. This approach is essentially the same one used for setting an MCLG for a non-carcinogen. Thus, for noncarcinogens, an MCLG will be used, if available, as the basic protection criterion when an MCL has not been developed.

For carcinogens, the interim protection criteria will be set at a level that corresponds to a negligible risk, i.e., the level of exposure that has an upper bound estimate of one in a million chance of causing cancer (see previous description). Establishment of interim protection criteria for pesticides in ground water will be a joint effort between EPA's Office of Drinking Water and the Office of Pesticide Programs. By 1987, EPA will have developed interim levels for over 60 pesticides through the Agency's health advisory process.

Since an MCL or an interim protection criteria is developed for human health reasons, these levels could pose unreasonable risks for fragile aquatic ecosystems. Of particular concern would be pesticide contamination that would result in risks to endangered species. Because EPA's policy is to protect the environment from unreasonable risk, EPA will extend this basic policy to the pesticides in ground water concern. EPA's Office of Pesticide Programs will work closely with the Office of Water Regulations and Standards in the latter Office's development of water quality criteria which can be use to help determine where pesticide contamination of ground water may pose an unreasonable risk.

3. <u>The Agency will use its protection goal for pesticides in ground water as its basic point-of-reference for both prevention and response actions</u>.

For response actions, the protection goal will be used as a reference for helping to determine where and what measures should be taken to protect human health. Contaminated ground waters that are current or potential sources of drinking water or ground waters of ecological significance are candidates for corrective efforts. Greater priority will be given to responding to contaminated ground waters that have high use and value as current drinking water supplies. At a minimum, response efforts will be focused on providing drinking water which is not contaminated above an MCL or an interim protection criterion.

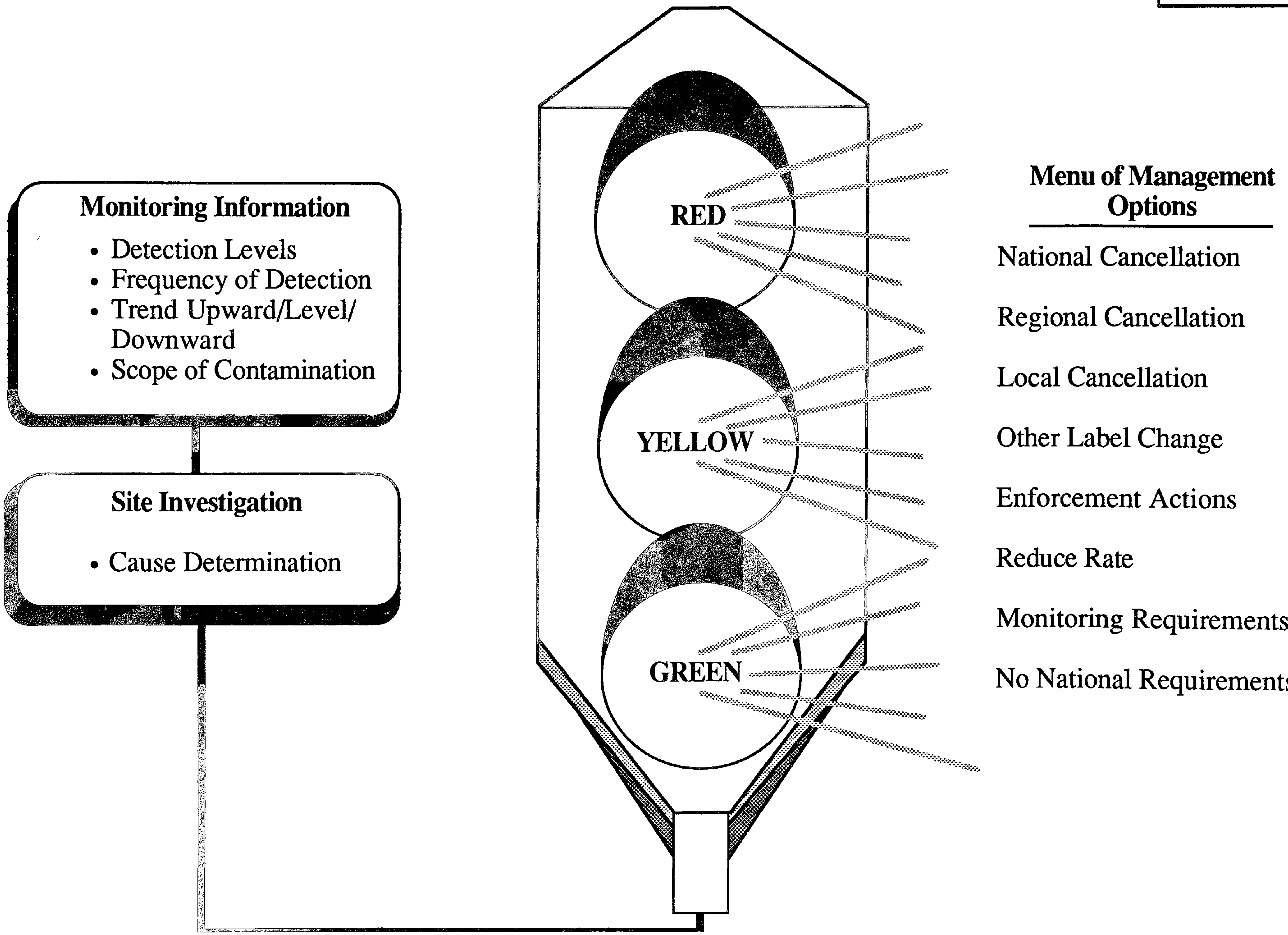
For prevention efforts, the goal will be used as the point of reference for determining when certain pesticide management actions may be needed. The aim of prevention efforts will be to reduce the likelihood of ground-water contamination reaching or exceeding an MCL or an interim protection criterion. Efforts to manage a pesticide's use will begin with early indications of its potential to contaminate ground water. These early indications can be based on information about the physical and chemical properties of the pesticide, how and where it may be used, and predictions of its fate in certain usage areas.

When a pesticide is found in ground water that is a current or potential drinking water source, additional management actions may need to be triggered. The need for, and the stringency of these management actions will depend on the number of sites where the pesticide is detected, the levels found, and whether those levels are increasing toward the MCL or another protection criterion. In effect, EPA intends to establish an "early-warning" or "yellow light/red light" management process (Figure II-11), whereby increasingly more stringent control measures will be applied in response to an increasing threat of a pesticide reaching or exceeding an MCL or other point of reference.

EPA's presumption is that the risks posed by pesticide contamination in current or potential drinking water, at or above the MCL or above a negligible

Figure II-11

EPA's "Yellow Light/Red Light" Approach



risk level, will usually be more significant than any local benefit derived from the pesticide's continued use. In some isolated cases, however, levels above the reference point may be tolerated if the benefits of the pesticide are uniquely critical.

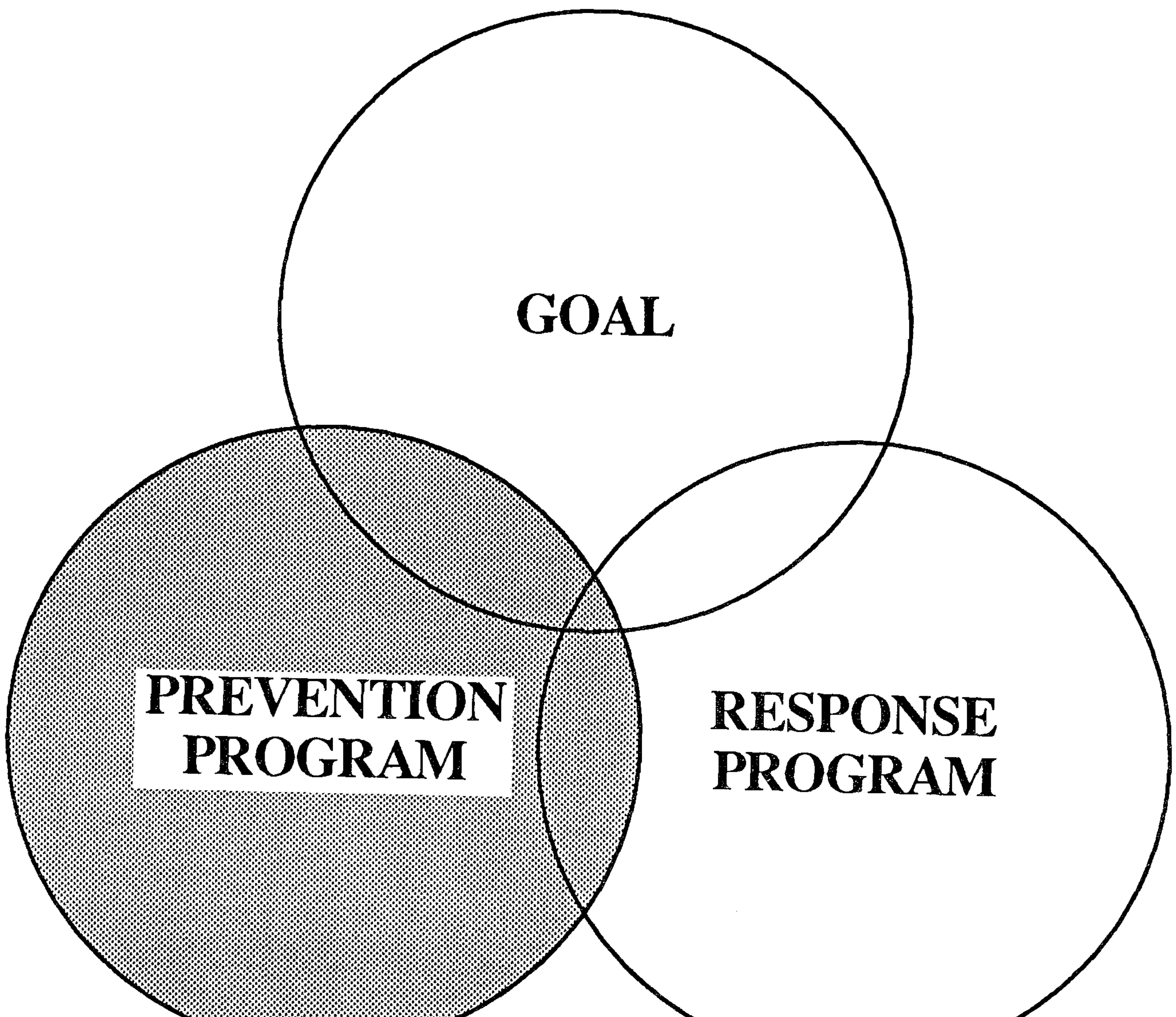
When contamination above an MCL or other EPA reference point is found, cancellation of that pesticide's registered use in the area may be the most appropriate response. However, an area cancellation would be deferred if the pesticide contamination were shown to be a result of an accident or misuse, or if it could be clearly demonstrated that alternative options for managing the pesticide's use would reduce the contamination permanently to an acceptable level below the MCL. The acceptance of such alternative management options would depend on the degree of confidence in the protection measures and the likelihood of their successful implementation. Futhermore, the benefits of the use of the pesticide would have to warrant such consideration.

When EPA considers taking action to mitigate ground-water threats, it must do so in the context of overall pesticide exposure risks, including risks to applicators and farm workers and risks to the general population through dietary exposure. The Agency will maintain its regulatory flexibility to delay or modify ground-water protection measures should the Agency find that pesticide substitutes or alternative use practices would result in greater overall pesticide risks.

In conclusion, EPA's proposed goal is to protect the ground-water resource from pesticide contamination. Protection efforts will be differentiated based on the use and value of different ground waters. Baseline protection, at a minimum, will focus on ground waters that are a current or potential drinking water supplies. Additional measures, beyond baseline protection, may be required to provide further assurances that certain "high priority ground waters" are not threatened by such contamination.

EPA will use MCLs, as defined under the SDWA, as its basic point-of-reference for determining protection of all ground waters that are current and potential drinking water supplies. When no MCL exists, EPA will use an MCLG or its equivalent for non-carcinogenic pesticides and a negligible risk level for carcinogenic pesticides. The Agency will also address any unreasonable risks to ecosystems.

Pesticide Strategy



CHAPTER 2
PREVENTION POLICY AND PROGRAM

Prevention of pesticide contamination of ground water is the centerpiece of the Agency's strategy for protecting ground water. As part of its prevention strategy, EPA will employ a three-prong approach to prevent pesticides from reaching an unacceptable level in ground water. First, EPA will take uniform action for pesticides posing widespread national concerns and will establish generic requirements for certain pesticide use and disposal practices that pose unique ground-water threats independent of area-specific ground-water conditions. Secondly, EPA will adopt a differential approach to the management of pesticide availability and use. Under this approach, prevention measures will be tailored to an area's ground-water conditions to the extent feasible. Certain state-wide or county-wide measures will be required by EPA. Additional site-specific measures will be required in which the user will be responsible for determining their applicability to a given application site based on site-specific ground-water vulnerability or his location in an area of "high priority ground water" (i.e., high use and value ground waters).

Third, the Agency will encourage a strong state role in the local management of pesticide use. Under this approach, a state will have the opportunity to develop a pesticide management plan that may be the basis for EPA's registration of a pesticide within that state. While the basis of a State plan must be to meet EPA's goal of protecting ground-water resources, a State will have flexibility in its management approach so as to better tailor measures to local needs.

Pesticide users and registrants will also continue to have key roles in protecting ground water. The users will be responsible for complying with label instructions and keeping informed of ways to prevent ground-water contamination, while the registrants will be responsible for monitoring certain ground waters and improving communication to the users on proper use of their products. Monitoring will play a major role in the prevention program by identifying potential contamination problems early and triggering appropriate pesticide management actions.

The next section discusses the options and factors that the Agency considered in developing its prevention strategy. Following this section is a detailed presentation of the Agency's proposed position on key aspects of the prevention approach.

SECTION 1: OPTIONS AND FACTORS CONSIDERED

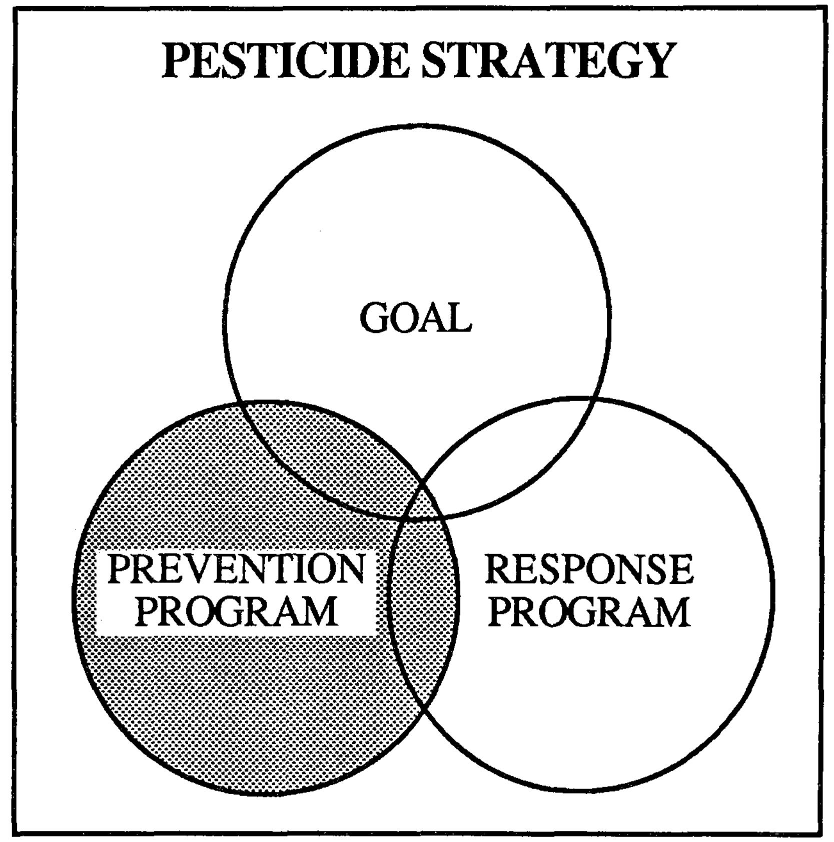
In designing its program for preventing ground-water contamination by pesticides, the Agency addressed two strategic questions: (1) how to address local variability and (2) what are the appropriate federal-state roles (Figure II-12). An important consideration, related to the latter issue, was determining the role of the pesticide user and registrant in ground-water protection. Another key consideration was how to control further contamination of ground water once a pesticide has been detected in an area.

1. How to Address Local Variability

Since 1970, EPA has been responsible for regulating the use of pesticides in the environment. Through its regulatory programs under FIFRA, the basic pesticide law, the Agency has developed a number of tools for controlling pesticide use in the United States. Foremost among these tools is the authority to require extensive environmental and toxicological testing of pesticides. Through its registration and reregistration programs, EPA can require the manufacturer, or registrant, to conduct comprehensive testing of a pesticide, including environmental fate studies that will indicate the potential of a pesticide to leach into ground-water.

Based on the results of these tests and other available data, the Agency approves or disapproves certain or all uses of a pesticide. When the Agency approves the use of a pesticide, it can further regulate the conditions of its use by imposing certain requirements or restrictions on the pesticide's labeling. Historically, the Agency has used product labeling as the major vehicle for communicating information to the users regarding proper application and disposal of pesticide products. For those pesticides that pose significant risks but do not warrant complete removal from the marketplace, the Agency may

Figure II-12



Prevention Program Issues:

- How to Address Local Variability
- What Are the Appropriate Federal/ State Roles
- How to Control Contamination

impose labeling requirements that change the rate, timing, or method of application or that restrict its use to trained and certified applicators.

Under FIFRA, the states have the primary responsibility for enforcing the proper use of pesticides, as defined by the EPA-approved label. States may also require more stringent controls than the Federal government for the use of pesticides within their individual states.

For dietary exposures and applicator or farm worker exposures, a uniform, national management approach is warranted. In the case of dietary exposures, differences among regions of the country are usually not significant since our food distribution system is national in scope. More important differences can be found among males and females or between infants, children, and adults due to differences in the diets of these subpopulations. Important differences also exist among these groups in their susceptibility to pesticide toxicity. For these reasons, the Agency generally evaluates the exposures from pesticides in the food supply based upon national averages for these subpopulations. Exposure to applicators or farm workers can also be regulated on a national basis by considering the physical-chemical properties of the pesticide and by requiring certain safety precautions on the label, such as protective clothing requirements.

Unlike dietary and applicator exposure, the pesticides in ground water concern does not lend itself easily to a uniform, national management approach. As previously mentioned, the use and value of ground water varies extensively across the country and as stated in the previous chapter, EPA will differentiate its protection efforts according to these differences. The vulnerability of ground water to pesticide contamination also varies substantially depending on such area-specific factors as the depth to ground water and the type of soil. Other factors that determine whether or not a pesticide will reach the ground water are local agricultural practices, the physical-chemical properties of the pesticides selected to deal with an area's pests, and how and when these pesticides are applied. A more detailed discussion of these factors can be found in the Problem Assessment of this strategy and in several other documents (e.g., Pesticides in Ground Water:

Background Document, U.S. EPA 1986; Practices to Mitigate Contamination of Ground Water from Pesticides Used in Crop Production, U.S. EPA, in draft).

In addition to distinctions in management plans based on the use and value of ground waters, distinctions based on different vulnerability of ground water may be appropriate.

Figure II-13 illustrates an ideal approach to managing pesticides based on differences in ground-water vulnerability to contamination. Ideally, prevention measures would be tailored so that they provide the optimum level of protection without undue restrictions. Any protective measures above this optimum line for a given level of vulnerability would provide more protection than is actually needed. Protective measures below this optimum line for a given level of vulnerability would provide less protection than is actually needed. This graph is used in the following presentation of three possible management approaches for addressing the variability in ground-water vulnerability:

a) **Uniform Approach** - A uniform approach essentially ignores area variability in vulnerability and applies the same prevention measures uniformly to all areas. If EPA relied on a uniform national approach to prevent ground-water contamination of pesticides, it would have to decide if its prevention decisions should be based on a worst-case situation of high vulnerability (Figure II-14a) or on a moderate case of medium vulnerability (Figure II-14b).

A worst-case basis could result in a great deal of overprotection for less vulnerable areas, while a moderate-case basis could result in both overprotection of low-vulnerability areas and underprotection of high-vulnerability areas. The obvious drawback of underprotection is the likelihood of ground-water contamination exceeding acceptable levels as defined by EPA's environmental goal. The problem with overprotection is that it could result in the loss of valuable pesticide uses in important farming areas of the country -- a situation that would not be compatible with the intent of FIFRA.

Figure II-13

"Ideal" Protection

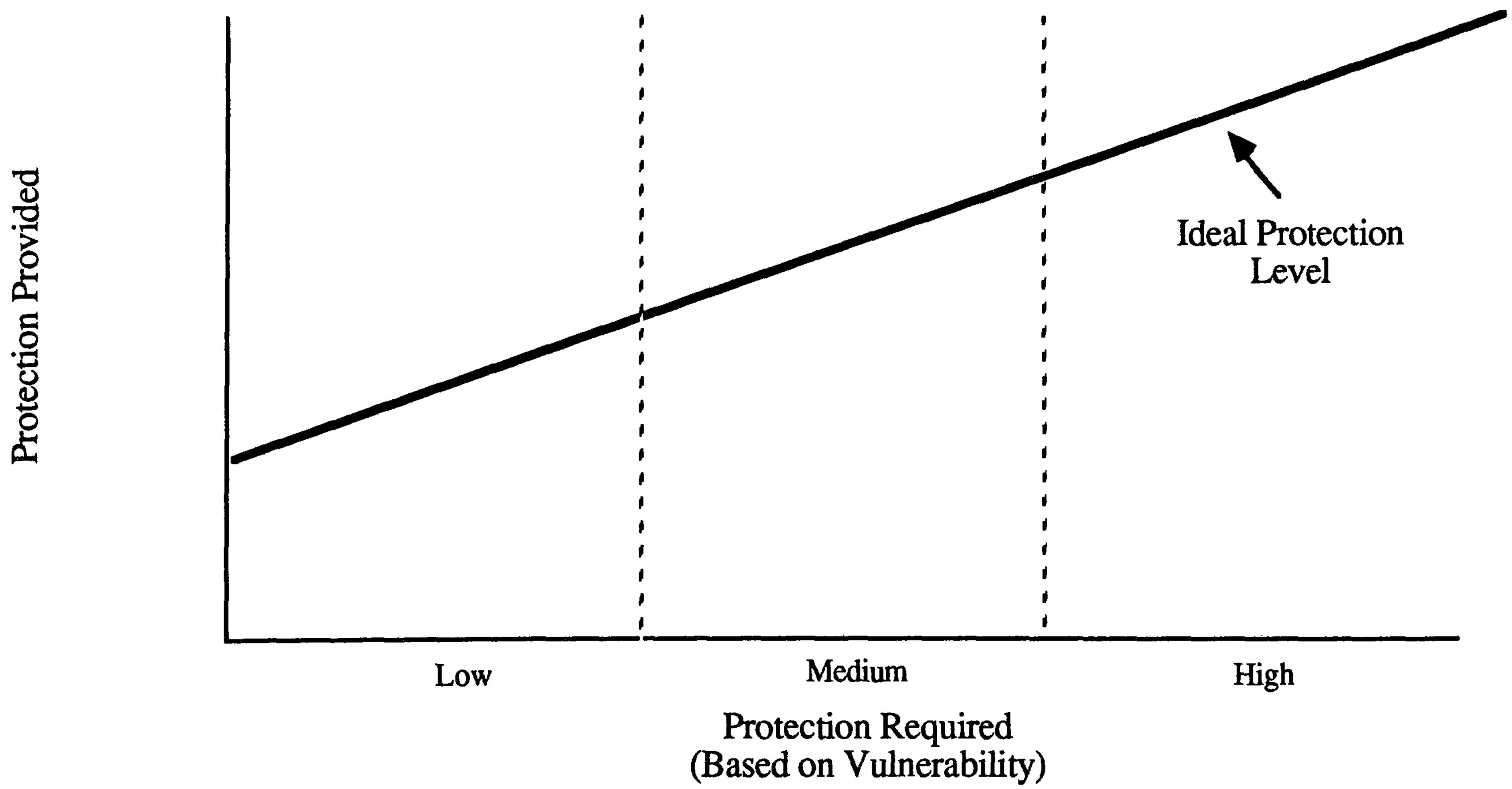
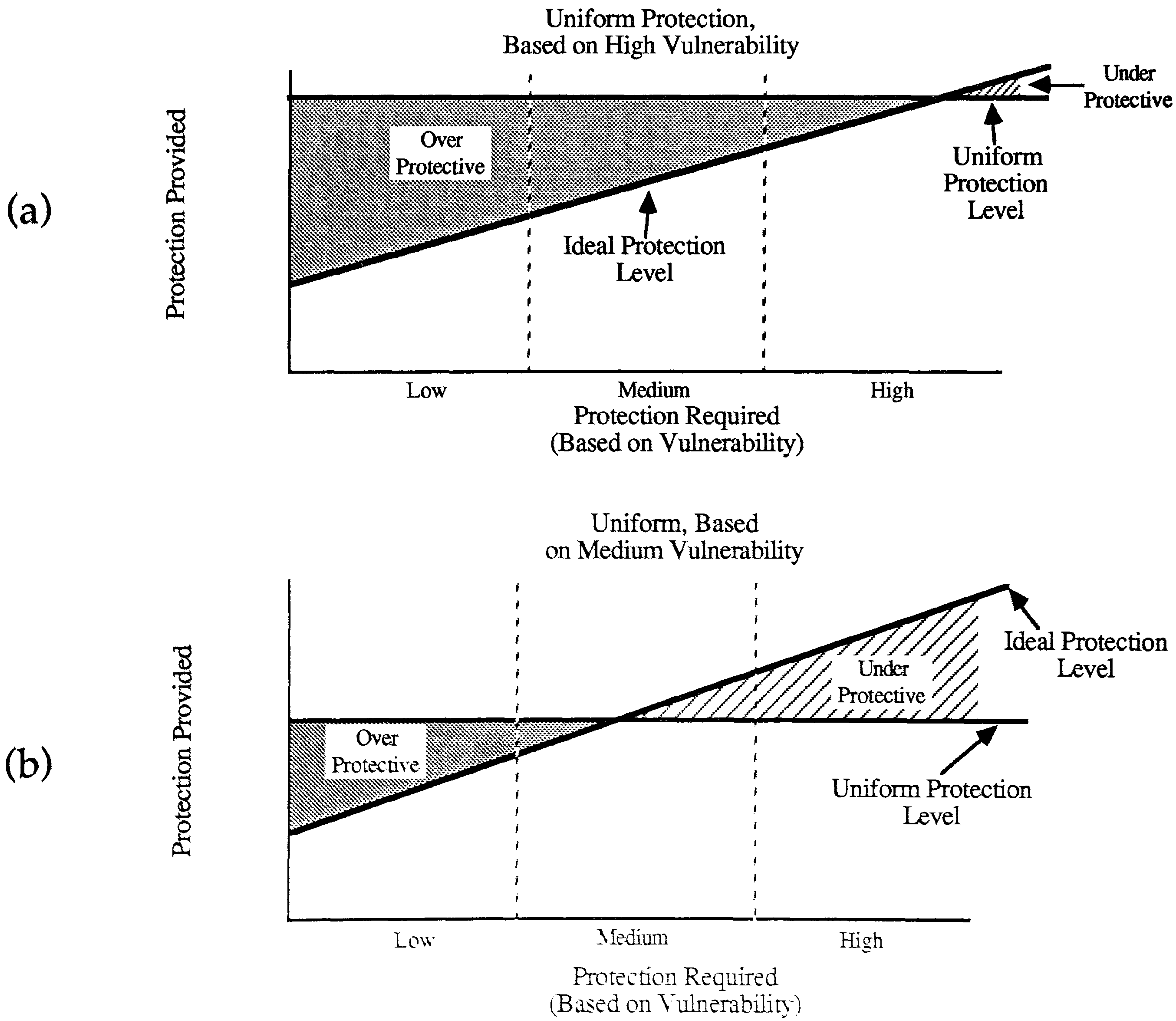


Figure II-14

Vulnerability-based Uniform Approaches



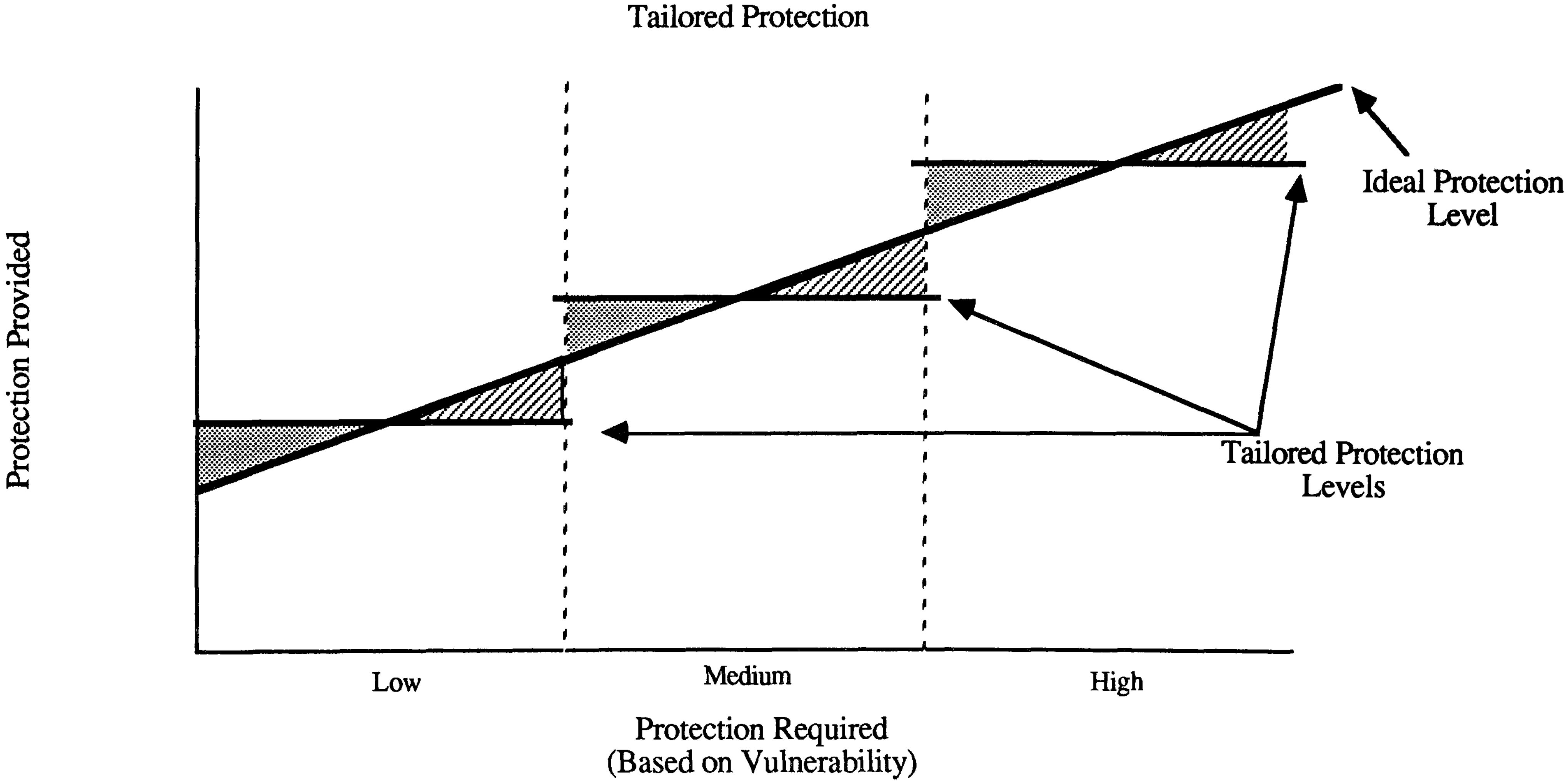
b) **Uniform Baseline Prevention Measures with Local Exemptions and Additional Special Measures** - Under this option, uniform baseline measures would be established for a pesticide in the same manner as the above option, but area-specific exemptions would be allowed for those places that would otherwise be overprotected. Such an approach could be implemented through a permit system in which exemptions to baseline requirements would be allowed for less vulnerable areas. Additional special measures could be applied on a case-by-case basis to those areas that would otherwise be underprotected. These additional measures could be specified on a label and the user made responsible for determining if they are applicable to his particular area.

While addressing some of the concerns for overprotection and underprotection of the previous option, this approach has some major limitations. A permit system carries major administrative costs and can place significant burdens on pesticide users. It would be highly impracticable for EPA to operate a national system of area-specific permits. Having the user determine the applicability of more restrictive measures could result in compliance problems. The user may not have the training to determine if his area is more vulnerable than the general case and, therefore, underprotected by the uniform measures.

c) **Differential Approach** (Figure II-15) - A third approach for addressing area variability is to tailor prevention measures to different levels of ground-water vulnerability. The number of vulnerability levels is practicably limited by: (1) the technical ability to accurately differentiate vulnerability; and (2) the number of different prevention measures that could reasonably be used to provide differential protection. Figure II-15 divides ground water into three different vulnerability levels. A different degree of stringency in prevention measures is then applied to each of these three levels of ground-water vulnerability. While there is still a likelihood of underprotection and overprotection measures for any given area, the number of such measures would be reduced in comparison to the first two options discussed above.

Figure II-15

Tailored Preventive Measures Based on Vulnerability



This option requires the designation and mapping of specific areas, based on ground water vulnerability, as well as the development of differential measures for each level of vulnerable ground water. The success of this option depends to a large extent on the degree of resolution (i.e., county, farm, acre, etc.) in designating and mapping local vulnerability. Note that such mapping would be in addition to mapping of ground waters by their use and value.

Vulnerability to pesticide contamination may be fairly uniform across some large areas, while in other areas, it may vary on a farm-by-farm basis, or even on an acre-by-acre basis. Figure II-16 presents the different degrees of resolution that could be used as the basis for differentiating agricultural areas by relative vulnerability. At one end of the spectrum is resolution at the national level, which as previously described, is the Agency's basis for addressing dietary and applicator exposure concerns. At the other end of the spectrum is resolution at the level of individual acres. Although making determinations of vulnerability at the highest degree of resolution would be the preferred technical basis for management, the sheer number of decisions required by such an approach could be overwhelming (See Figure II-17). EPA may be able to manage a differential approach to pesticide use at one degree of resolution, whereas a state may be successful in conducting a management program at a much higher degree of resolution. A state should also be in a better position to make decisions on the use and value of ground-water in a given location. Who should determine the vulnerability and the use and value of ground water in an area and who should manage a differential approach are the subjects of the second strategic question.

2. <u>What Are the Appropriate Federal/State Roles?</u>

The options the Agency has considered for federal and state roles in addressing ground-water contamination using a differential approach are as follows:

Figure II-16

Level of Resolution

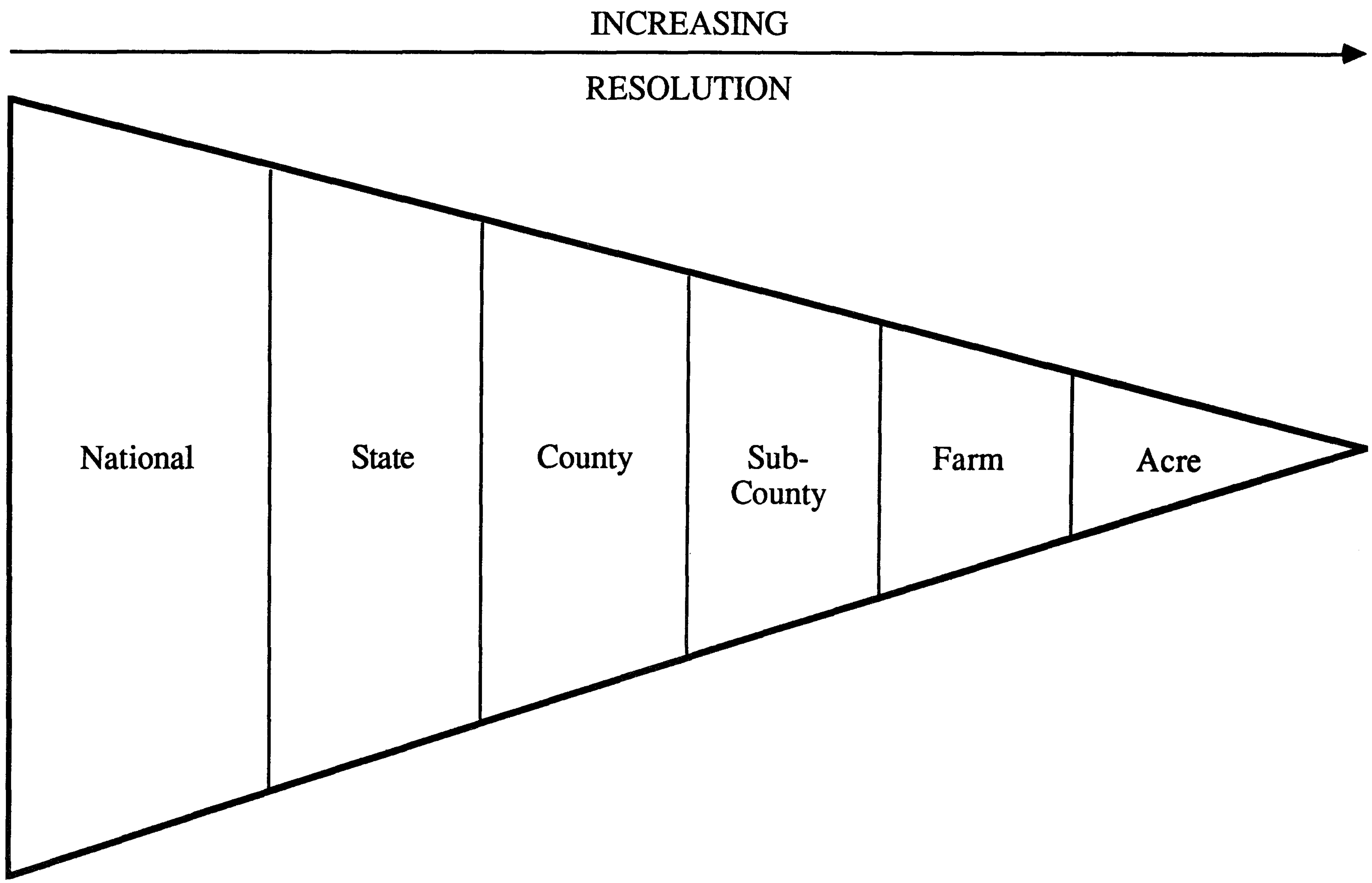
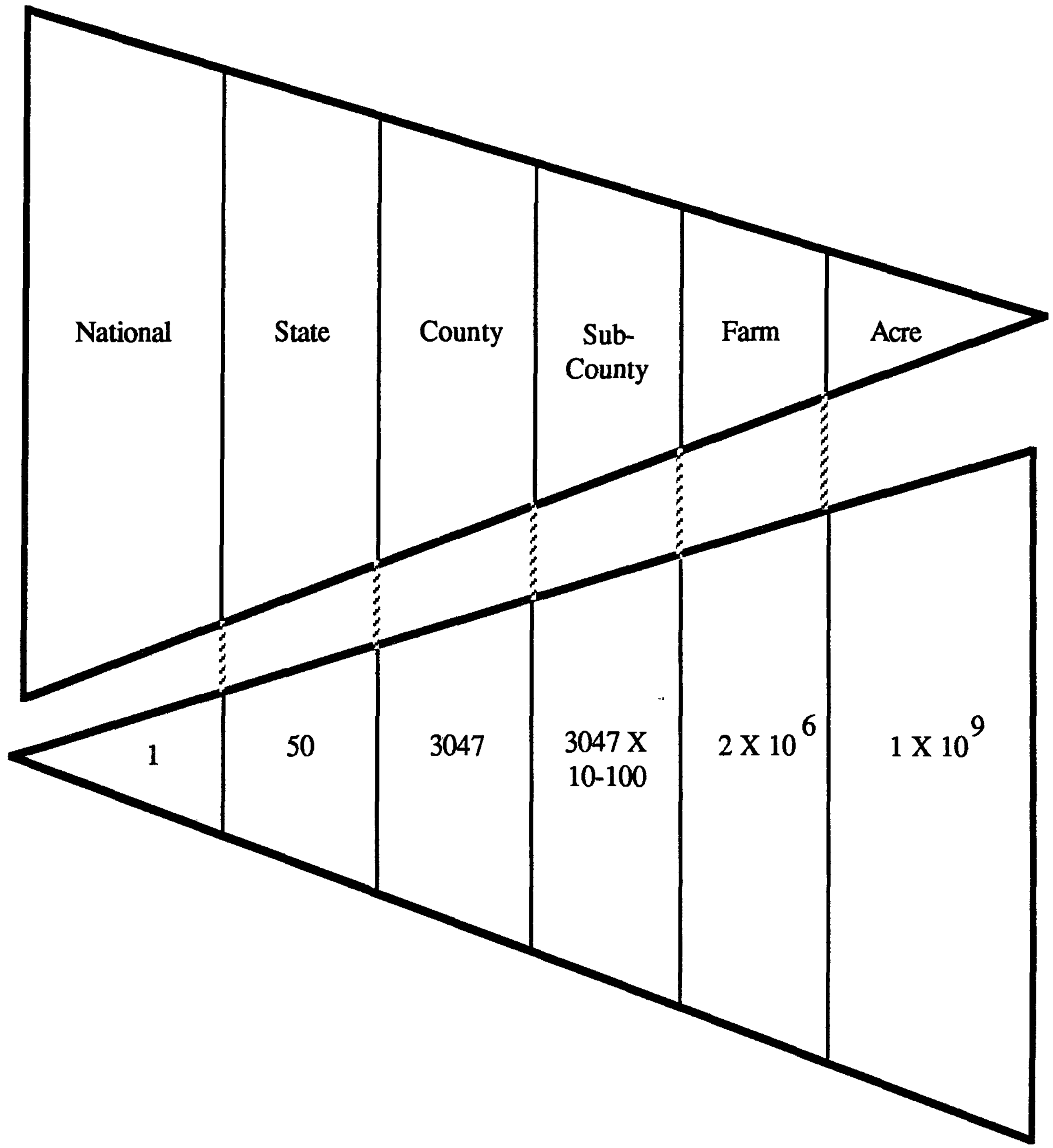


Figure II-17

Level of Resolution



a) **EPA Establishes Differential Measures/User Determines Applicability** - In this approach (Figure II-18), the Agency would establish differential protective measures for a pesticide based on ground-water use and value considerations and/or different levels of vulnerability of the ground water where the pesticide is being used or proposed for use. The Agency may decide that certain pesticides cannot be used in areas of high use and value and/or high vulnerability. For moderately-vulnerable areas, the use of the pesticide could be subject to special restrictions, such as changes in the rate, timing, or method of application. Furthermore, representative monitoring of ground water for the pesticide in these moderately-vulnerable areas could be required of the registrant to ensure that no threat of unacceptable contamination emerges. For low-vulnerability areas, special ground-water protection measures might not be required, although there might be applicable generic requirements, such as a requirement for special measures near drinking water wells.

An important characteristic of this option is that the user would be primarily responsible for determining the applicability of differential requirements based on a required assessment of local vulnerability and his location within an area of "high priority ground waters". The user would base a decision on label directions and possibly on supplemental instruction or training. One problem with this option is that most users do not have the scientific background in hydrogeology or environmental fate processes to make accurate field decisions. With this option, directions must be provided that translate technical assessments of ground-water vulnerability into directions that a user can understand and apply. However, determinations of ground-water vulnerability to pesticide contamination are very complex, and simple but effective label directions for users are difficult. Due to these constraints, implementing this option could likely result in misuse and possible contamination of ground water.

b) **EPA Specifies Differential Measures for Individual Counties or States; Users Determine Applicability of EPA-Specified Sub-County Measures** (Figure II-18b) - As with the previous option, the Agency would develop differential prevention measures based on ground-water use and value and/or

Figure II-18a

Roles and Responsibilities

Option "A"

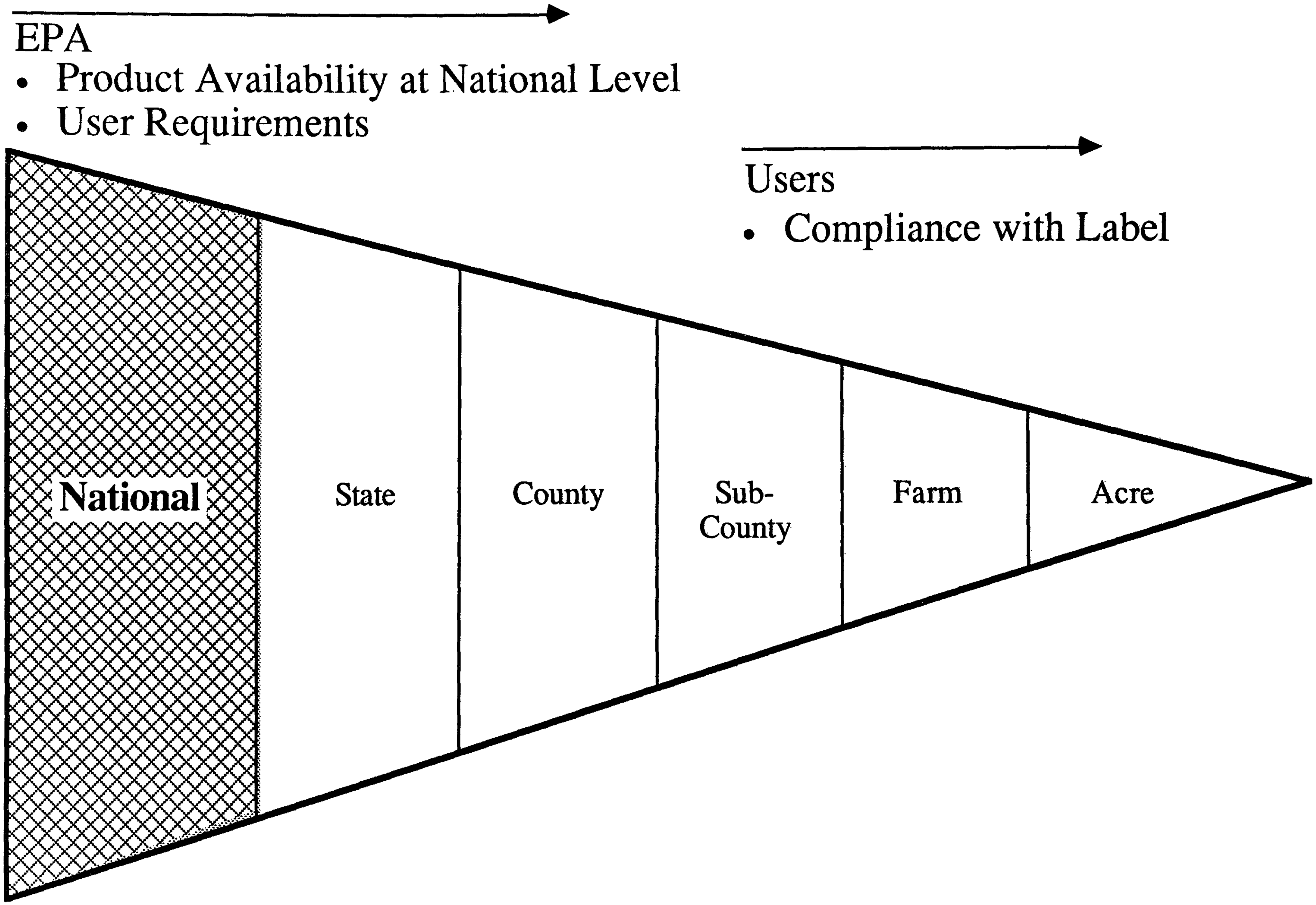


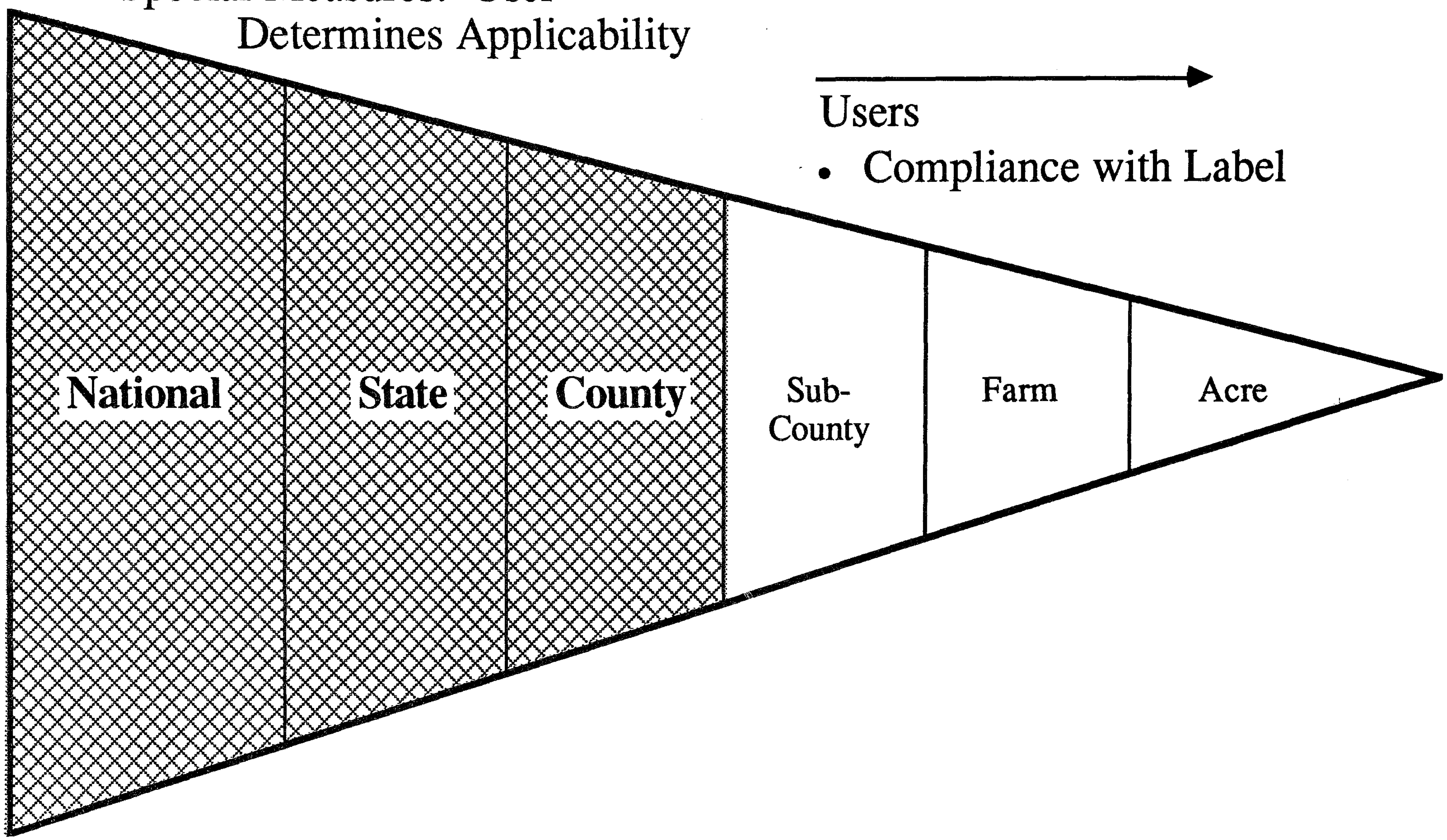
Figure II-18b

Roles and Responsibilities

Option "B"

EPA
- Product Availability at National, State, or County Level
- User Requirements
  - -- National, State, or County Measures
  - -- Special Measures: User Determines Applicability

Users
- Compliance with Label



different degrees of vulnerability, but in this option the Agency would identify or map vulnerability areas on a county basis. This information would be provided to the user on the label, supplemental labeling, or by other means.

While EPA's designation of ground-water vulnerability could be based on sub-county assessments, the actual management of pesticide use could only occur, at best, at the county level. This is due to administrative factors, such as labeling constraints and enforcement considerations. In fact, there might be certain situations in which EPA would decide to apply the same protection measures to an entire state as a result of these administrative difficulties. At this level of resolution, EPA would base minimum county- or state-wide measures on the assumption that all ground waters in the area are, at least, a current or potential drinking water source.

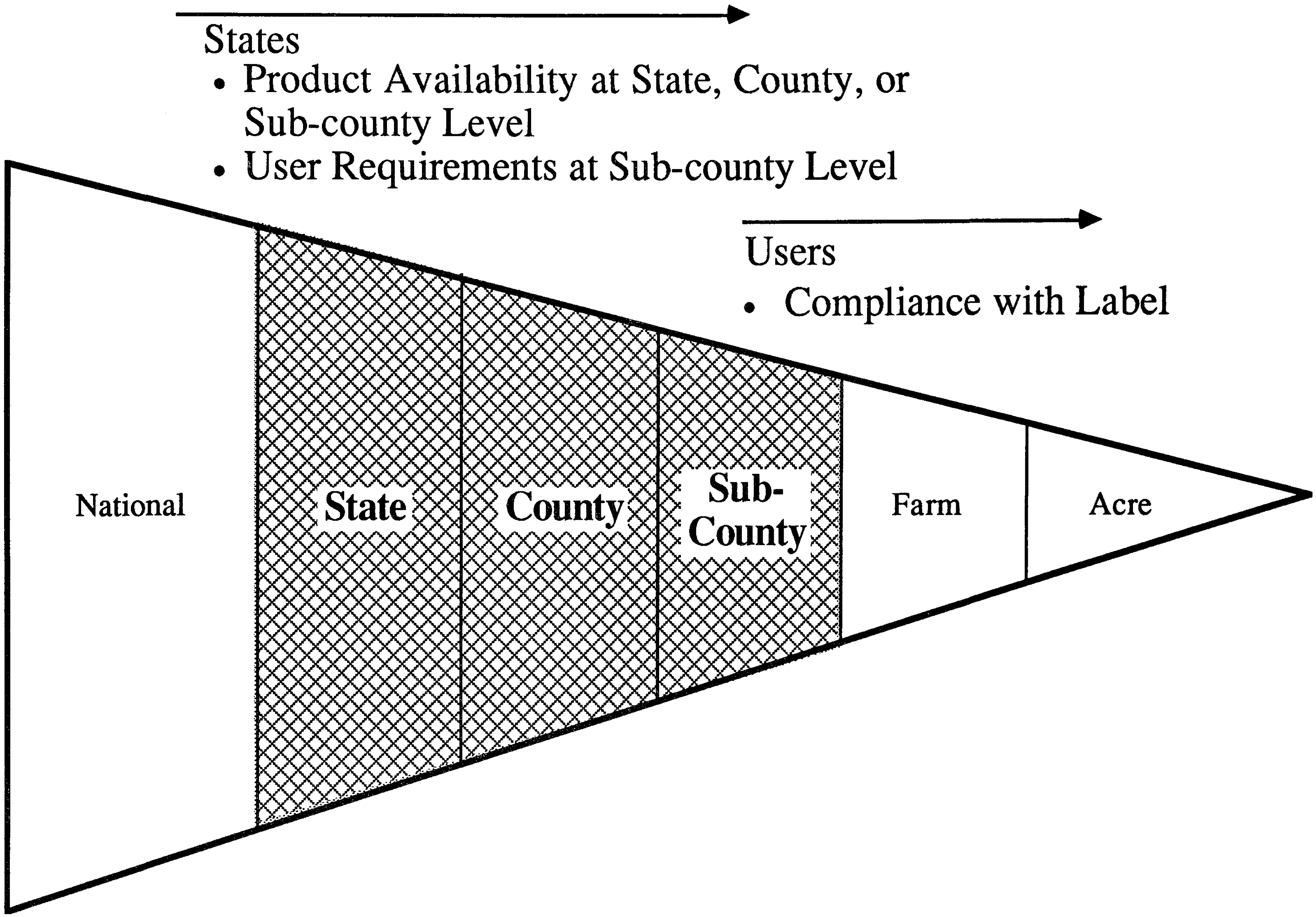
Since the vulnerability within a county can vary greatly, this approach could unnecessarily apply stringent measures, including local bans, to sub-county areas that are less vulnerable than the average for the county in which they are located. Similarly, such variation could result in underprotection for sub-county areas more vulnerable than a county average. This latter possibility could cause the Agency to make overly-conservative decisions when classifying counties based on vulnerability. As with the first option, the user would be required to make difficult location-specific judgments on the applicability of prevention measures that would be more stringent than the minimal county-wide requirements due to site-specific vulnerability or his location within an area of "high priority ground water".

c) **State Specifies Differential Measures for Sub-County Areas Based on EPA Criteria** (Figure II-18c) - With this option, the state would have the dominant role in determining differential prevention measures, but based on EPA criteria. The states would identify and map its ground waters in terms of use, value and vulnerability and provide pesticide users with explicit directions on where and how pesticides could be applied.

Figure II-18c

Roles and Responsibilities

Option "C"



The states should be able to provide a differential management approach based on highly-specific area designation of ground-water vulnerability, use and value. As such, the user in the field would have more explicit directions as to where and how the pesticide could be used, and would not have to determine local vulnerability. Another advantage to this option is that the state could also closely tie user training and enforcement efforts to its own differential approach.

Although the states are in a better position than EPA to understand local conditions and establish a differential approach that is highly tailored to these conditions, there are a number of drawbacks to this option. These include the potential lack of uniformity among states and possible political and legislative constraints within particular states, which may jeopardize obtainment of EPA's environmental goal of protecting the ground-water resource. The option could also result in the inefficient use of state resources due to unnecessary duplicative efforts in developing pesticide prevention measures.

SECTION 2: EPA'S PROPOSED POSITION

EPA will employ each of the three basic management approaches, described above, to prevent pesticides from reaching unacceptable levels in ground water. EPA will continue to develop uniform, national measures, but will also begin to implement a differential management approach at the county level or, in some cases, at the state level. A state will have the opportunity to take a stronger role in local pesticide management through the development of a state management plan. The responsibilities of pesticide users and registrants will grow along with an increasing reliance on monitoring information.

EPA's specific strategic policies are as follows:

1. EPA will continue to take uniform action for pesticides causing widespread, national concerns and will establish generic prevention measures to address certain pesticide use and disposal practices that pose ground-water threats independent of area-specific vulnerability. National uniform measures will not be differentiated on the basis of local differences.

Obviously, when a pesticide's use poses a serious, widespread ground-water threat, EPA will take steps at the national level and, if necessary, impose a regional or even a national cancellation of the use of the pesticide. Of particular national concern are those general ground-water threats that are not dependent on local vulnerability and require generic prevention measures. For example, EPA has proposed regulations for the application of pesticides through irrigation waters, often referred to as chemigation. This practice can directly introduce pesticides into ground water if precautions, such as anti-back siphoning devices are not used.

EPA is also developing a rule to restrict the use of potential leaching pesticides to certified applicators. The Agency is also considering the development of national rules to address the potential problem of pesticide applications too near a well which can result in "run-in" of pesticides into ground water, a particular problem in areas with uncapped, abandoned wells. Finally, EPA is considering additional generic rules and guidelines for pesticide disposal and for preventing and handling leaks and spills, all of which can be important sources of a number of pesticide concerns, including ground-water contamination. For the disposal concern, EPA is looking at its options under both FIFRA and RCRA.

2. EPA will also adopt a new approach of differential management of pesticide use based on differences in ground-water use, value and vulnerability to an extent that is administratively feasible. County-level or state-level measures based on ground-water vulnerability will be employed including use cancellations. In some cases, the user will have to determine the applicability of differential prevention measures

based on interpretation of local field conditions and his location within areas of "high priority ground waters".

When a pesticide poses serious but localized risks due to local ground-water vulnerability, an appropriate prevention approach is to remove the threat where it exists and allow the use of the pesticide in other areas to continue without undue restrictions. EPA's prevention measures will thus be differentiated in their stringency on the basis of relative vulnerability of local ground water to pesticide contamination. Because of a number of administrative limitations, as mentioned earlier, EPA's prevention measures will generally be differentiated at the county or state level. EPA will do its best to assess the vulnerability of pesticide usage areas within counties and to determine the appropriate mix of prevention measures necessary to protect ground waters within the entire county. At this level of aggregation, EPA will have to assume that all ground water, at a minimum, is a current or potential drinking water source requiring protection.

Prevention measures will include minimum, county-wide requirements that must be followed by all users within a designated county. For some counties, the minimum measure may be a ban on a pesticide's use. For other counties, the pesticide's use will be allowed, but minimum county-wide measures will range from general advisories to extensive requirements involving changes in the rate, timing, or method of application or other agricultural practices that can influence pesticide movement to ground water. Additional measures, beyond minimum county-wide requirements, could also be required of users in certain areas of a county. The determination of the applicability of these additional measures will be the responsibility of the user and will be based on site-specific factors, such as the presence of ground-water conditions more vulnerable than generally found in a county or the need to protect certain "high priority ground waters", such as those within a drinking water wellhead protection area.

In some cases, EPA may apply minimum prevention measures, including geographic bans, to an entire state. Such a situation may occur where there is generally uniform ground-water vulnerability to contamination by a pesticide in all usage areas of a state. State-wide measures could also occur where EPA believes the state does not have the ability to support a differential approach to the management of pesticides, particularly from enforcement and user education perspectives.

3. EPA will encourage the development of a strong state role in area-specific management of pesticide use to protect the ground-water resource. State pesticide management plans will be used to strengthen EPA's foundation for decisions on pesticide use. In some cases, the use of a pesticide in a state will depend on the existence of and adequacy of such a state management plan. State management plans will develop and implement highly tailored prevention measures based on local differences in ground-water use, value and vulnerability.

As discussed earlier, there are a number of limitations to an EPA-directed differential management approach for pesticides at the county or state level. Such an approach can prohibit or restrict the use of a pesticide unnecessarily in some areas. This approach also places a major burden on the user to determine the applicability of more restrictive measures that are based on site-specific conditions that he must assess. These disadvantages could result in noncompliance and a failure of this approach to meet EPA's environmental goal of protecting the ground-water resource. Therefore, the Agency is looking for strong state involvement to determine where a pesticide can, and cannot, be used without ground-water restrictions. This alternative cooperative approach between EPA and a state will lessen the burden on the user to determine the applicability of site-specific measures, and in turn, reduce noncompliance and increase the likelihood of attainment of EPA's environmental goal.

Often states can have the technical expertise and have more specific knowledge of local ground-water conditions and agricultural practices than EPA. State are also likely to be in a better position to work more directly with the user to ensure that potential ground-water contamination problems are identified and that pesticides are properly used to avoid these problems. EPA wants to strengthen and utilize the unique position of the states in efforts to prevent ground-water contamination by encouraging the states to develop pesticide management plans to protect their local ground waters.

Under a state management plan, the state would identify where pesticides of ground-water concern are being used or are likely to be used. The state would also classify and map its ground-water resources and determine where protection measures would be differentiated based on local differences in the use and value as well as vulnerability of ground waters. The state would have to adopt prevention measures that would protect current and future drinking water sources as well as ground waters that are ecologically important; the level of protection must reflect EPA's environmental goal. As part of its management plan, the state could also identify areas with "high priority ground waters", such as Wellhead Protection Areas, where more stringent measures may be required.

In some cases, the state would obviously have to employ EPA-designated measures for certain types of areas, such as local cancellations of high risk pesticides in highly vulnerable ground-water areas. However, it is EPA's intent that a state generally have the opportunity to select from a broad menu of management measures (Table II-1) and to tailor prevention to local needs. Some of these measures may be Best Management Practices (BMPs) which have been developed and demonstrated by a state, perhaps under EPA's Nonpoint Source Program. Those measures which are chosen by a state will have to be supported by strong, coordinated education and enforcement programs.

Development and implementation of a state management plan will require the active participation of all key state agencies including the departments of agriculture, public health, and water, natural resources, or environmental protection. A state's pesticide management plan will be a key component of its overall ground-water protection strategy and should be consistent with its Wellhead Protection Program, if one exists. The state should take a wholistic approach to protecting its water resources and realize the important relationship between ground-water protection and surface water quality. The state pesticide management plan should be consistent with any state clean water strategy for protecting surface waters.

When deciding on the national registration of a pesticide with ground-water contamination concerns, EPA will consider a state's mangement plan. EPA will

Table II-1

State Management Menu

Pesticide Use
• Moratorium Areas • Wellhead Protection Areas • Well Set Backs (Buffer Zones) • Future Well Requirements: Location, Depth, Construction • Change in Rate of Application • Change in Timing of Application • Change in Method of Application • Advance Notice of Application • Integrated Pest Management • Best Management Practices • Additional Monitoring • Additional Training and Certification

work with each state to determine if a pesticide's use can be managed locally by the state to prevent or reduce the threat of ground-water contamination. In some situations, EPA will require a state-specific label or supplemental labeling with the approved conditions of use based on a state management plan. In other cases, EPA will have to cancel the use of a pesticide that poses a significant ground-water threat in an entire state if there is no adequate state management plan that can reasonably be expected to prevent or reduce the threat of unacceptable contamination.

While EPA's long-term objective is to encourage states to develop generic management plans that can be applied to any specific pesticide, the Agency may also require chemical-specific management schemes for those pesticides that pose major ground-water risks within a particular state. As EPA and the states gain practical experience with the concept of state management plans, and as our understanding of approaches for mitigation of pesticide contamination increases, the need for chemical-specific schemes will diminish. However, it should be recognized that even when generic state plans have been in place for some time, the states may still need to develop chemical-specific management schemes under certain conditions.

Development of a management plan does not necessarily have to be accomplished by each state acting alone. Where ground-water resources are continuous under state boundaries and contamination problems in one state could threaten the quality of waters of another state, it would make sense for adjacent states to coordinate their state plan development. In the case of chemical-specific schemes, certain states may also find multi-state or regional management schemes desirable to obtain or continue EPA's registration of a pesticide that is important to a regional crop.

One of EPA's key responsibilities under this approach will be to provide as much technical support to the states as possible, including information on the physical/chemical/toxicological characteristics of pesticides of concern and their behavior in the environment. To meet this responsibility, EPA will keep abreast of monitoring information to detect new pesticide contamination concerns as well as to assess the effectiveness of various management approaches. The Agency will also keep the states informed of national trends and will facilitate exchange of information between the states on the problems and successes of different local management approaches. Through the Office of Ground-Water Protection's Wellhead Protection Program, and through several CWA grant programs, including the nonpoint source authorities, EPA will provide financial and technical support to states for the development and implementation of their state management plans. The Agency will also coordinate with other federal agencies, such as USDA and USGS, to conduct research and to communicate results to the states on pesticide behavior, monitoring methods, best management practices, and other technological information needs.

Table II-2 provides scenarios for how pesticides that pose a moderate to high ground-water threat would be managed in states with different vulnerability situations. Two options are presented: 1) no state plan; and 2) state plan in place.

4. <u>The user's role in preventing ground-water contamination is pivotal; his decision-making in the field must be better supported.</u>

Regardless of whether a pesticide is managed under an EPA-State cooperative management approach or an EPA-only approach, the user will continue to be in the unique position of directly controlling the use of pesticides in the field. Thus, the user has the responsibility to seek better understanding of ground-water concerns. At a minimum, a user must follow the instructions found on the label of each pesticide product and when required, be trained and certified in the proper use of the pesticide.

However, we cannot expect the typical pesticide user to make highly technical decisions on his own. The best approach is to provide the user with clear instructions either to not use a pesticide or to use it in a certain manner in highly specified areas. Such areas should be familiar to the user or a map should be provided that clearly delineates the area. To some degree, a state's management plan should have the capability to provide such specificity.

However, as discussed earlier, the area-specific nature of ground water could still require the user to identify vulnerable ground water in his

Table II-2

Comparison of Possible Outcomes for Pesticide Use in a State

Situation	No State Plan	State Management Plan
High-risk pesticide State has extensive high-vulnerability areas	Probable statewide cancellation	Possible special state management measures in lieu of EPA cancellation
High-risk pesticide State has mixture of high- to moderate-vulnerability areas	Possible statewide cancellation Probable county cancellations County-based use requirements Other use requirements[1] Monitoring requirements	Possible county cancellations Area-specific use moratoriums Area-specific use requirements Monitoring requirements
Moderate-risk pesticide State has primarily moderate-vulnerability areas	Possible county cancellation County-based use requirements Other use requirements Monitoring requirements	Possible area-specific use moratoriums Area-specific use requirements Possible monitoring requirements

[1] These requirements include measures for protection of "high-priority areas" such as within the immediate vicinity of drinking water wells. It also includes generic prevention measures such as those required for chemigation practices. Finally, these requirements include those measures that the user would have to determine are needed in an area based on a required assessment of the ground water of the specific site.

specific fields and to determine if special prevention measures are needed. This will be especially true where the state has not taken an active management role. There are no easy formulas to provide exact "answers" to the user through label instructions alone. The Agency recognizes that it and the states must provide better support to the user for making proper use decisions. USDA, with its existing field network, also can play a key role.

A major vehicle for improving user decisions in the field is applicator training and certification programs. EPA is establishing a generic rule for restricting the use of those pesticides with potential ground-water threats to certified applicators. Working with the states and the Cooperative Extension Service, EPA is attempting to improve and expand training and certification programs so that users may become more aware of ground-water concerns and the measures necessary to protect this vital resource.

5. Registrant responsibilities will need to grow in three areas: (1) technical support for the user in the field; (2) ground-water monitoring to ensure the adequacy of pesticide management plans in protecting ground water; and (3) the development of safer alternative pesticides.

While there are state and federal programs that can shoulder some of the need, registrants will need to play a greater role in assisting the user in the proper, environmentally sound application of their products.

In the future, registrants will also be expected to conduct representative monitoring of ground water in areas where pesticide use occurs and where ground water may be vulnerable. These studies will be critical to ensure that protection efforts are working. Where there is a potential ground-water contamination concern, certain new registrations may be granted on the condition that the registrant conduct monitoring studies. Continued registration of certain pesticides, under a state management plan, may also hinge on monitoring data to indicate the environmental adequacy of those management efforts. Registrants may find it beneficial to pool their efforts to establish a joint and effective monitoring capability.

Table II-3

Responsibilities in the Strategic Prevention Approach

EPA

Responsiblity Level: National, County or State

Responsibilities:

- Differential Preventive Measures
  - -- Minimum Statewide or Countywide Requirements
  - -- User Site Requirements
- County, State, or National Cancellations
- Generic National Measures for Pesticide Use
- Oversight of State Plans
- Technical Support to States
- Labelling Requirements

STATE

Responsibility Level: State, County or Sub-County

Responsibilities:

- State Management Plan -- Foundation for EPA Use Decisions
  - -- Identify Pesticide Use Locations
  - -- Classify & Map Ground Water Resources. Designate Vulnerability
  - -- Tailor Prevention Measures to Meet EPA Goal
- User Support
- Monitoring

USER

Responsibility Level: Site Specific

Responsibilities:

- Additional Understanding of Ground Water Concerns
- Close Adherence to Labels
- Application Training and Certification as Necessary

REGISTRANT

Responsibility Level: All

Responsibilities:

- Technical Support of User
- Ground Water Monitoring
- Safer Alternative Pesticides

Finally, registrants will be expected to develop safer alternative pesticides that do not pose a threat to ground water. This message will become increasingly obvious to the registrants as the Agency and the states continue to restrict or cancel the uses of more pesticides that threaten the quality of the nation's ground waters.

6. Increased monitoring of pesticides in ground water is critical to the implementation of this strategy. EPA will establish an "early-warning," or "yellow light/red light," approach to prevent further area contamination, once detected. The approach will use the MCL or other EPA-specified protection criteria as the point of reference to evaluate, and when necessary, change pesticide management plans.

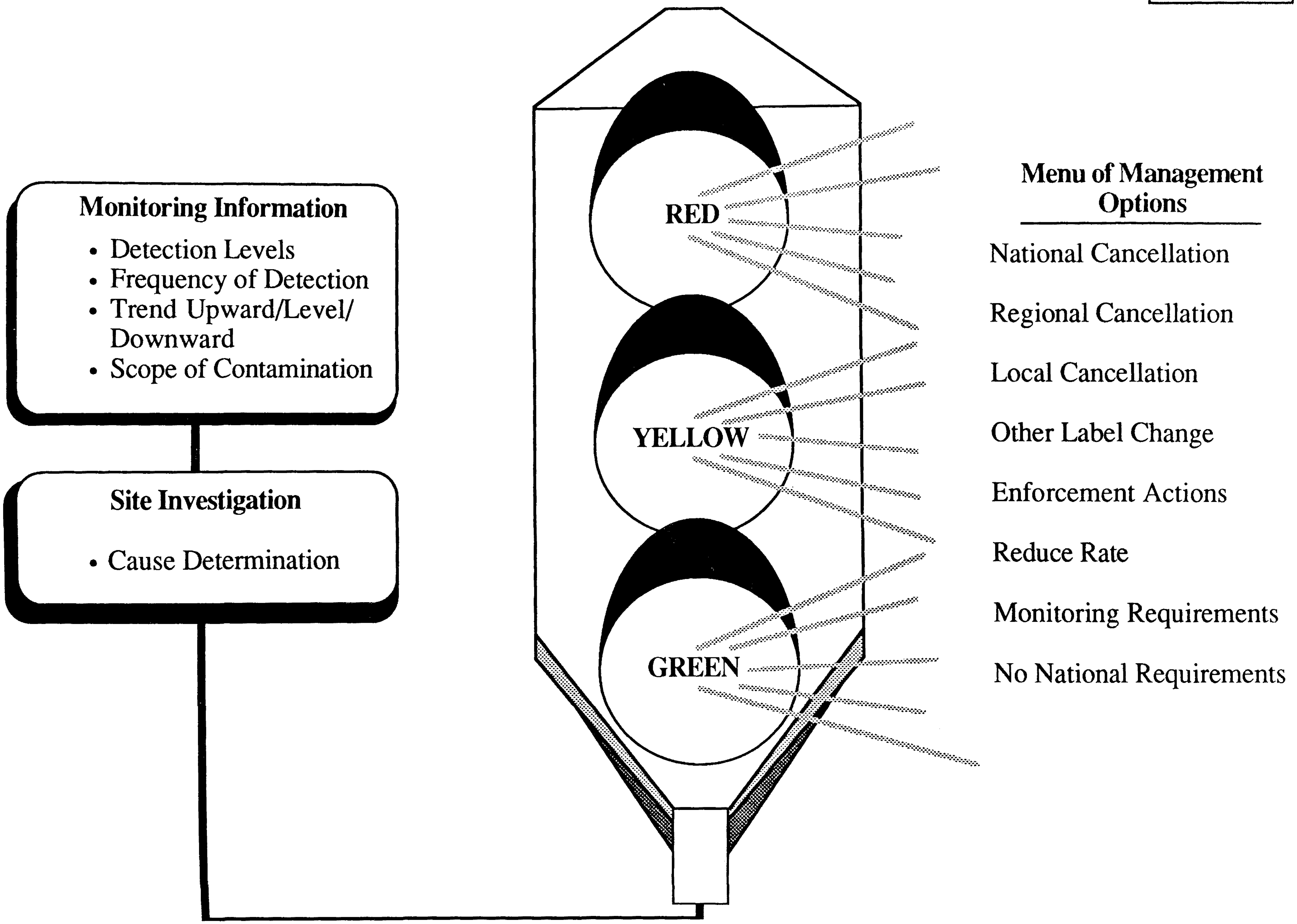
Even though the Agency has developed a number of models for predicting ground-water contamination, there is still a great deal of uncertainty in identifying the exact locations of areas vulnerable to contamination and in estimating the levels of contamination that could be reached in the ground waters of these areas. Thus, monitoring of pesticides in this environmental medium is a critical need that can provide the needed feedback to determine the success or failure of pesticide management efforts.

EPA or a state, under its management plan, will direct or conduct monitoring of pesticides in ground water that is representative of where the pesticide use occurs and where there is a potential ground-water problem. When pesticide contamination is found to be moving toward an MCL or other EPA-designated ground-water protection criteria, EPA or the state will revise the pesticide's management plan, as necessary, to prevent further contamination. The stringency of new measures will depend on indicators of the likelihood of contamination reaching or exceeding these reference points in current or future drinking water or ground water of ecological importance. Factors to be considered are the levels found, the number of contamination sites, whether the trend is upward, and the cause, if known (Figure II-19).

As discussed above, registrants will often be responsible for conducting monitoring in representative areas of a pesticide's use. The registrant may

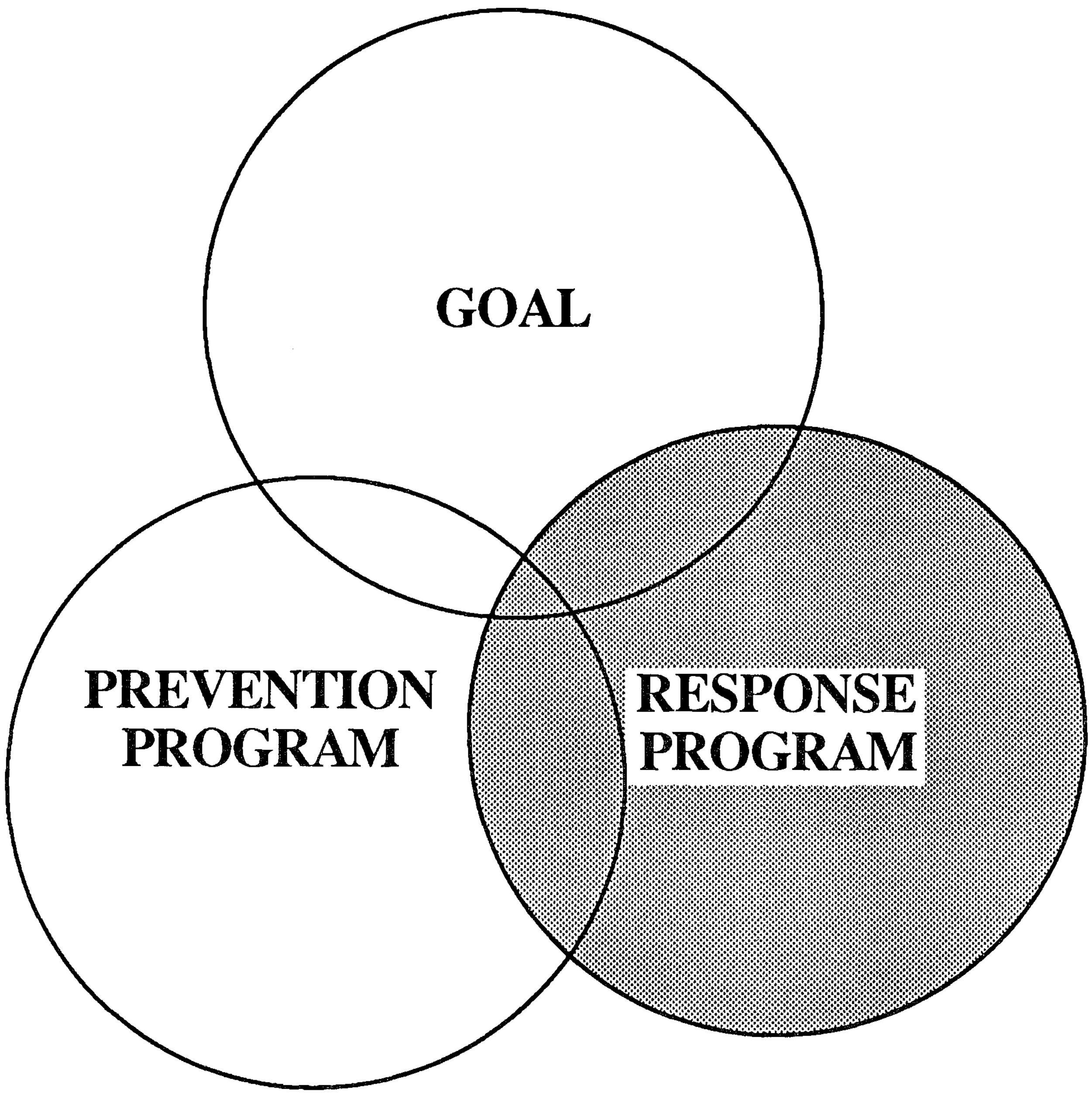
Figure II-19

EPA's "Yellow Light/Red Light" Approach



also be required to do site-specific monitoring in an area where contamination has already occurred if he desires to continue the registration of the pesticide in that area or other areas with similar pesticide use characteristics and ground-water vulnerability.

Pesticide Strategy



CHAPTER 3
RESPONSE POLICY AND PROGRAM

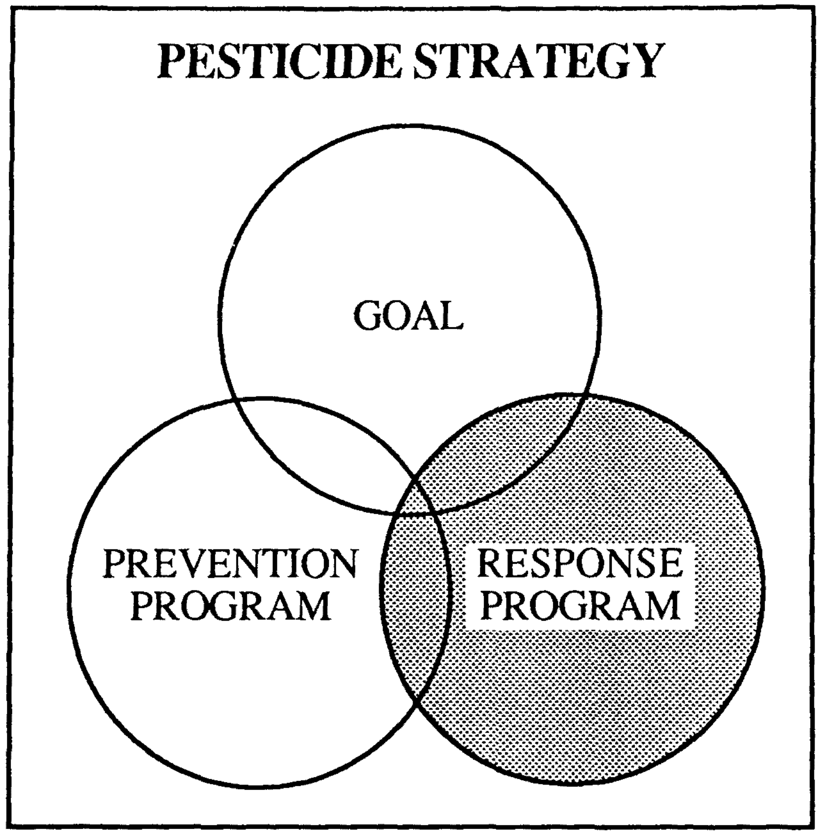
One of the most challenging tasks facing the Agency and the states is developing a strategy for responding to ground-water contamination resulting from normal use of pesticides. EPA's approach will be to work closely with the states in their efforts to remove public health threats. Where a pesticide has reached unacceptable levels, strong actions will be taken to prevent further contamination. The Agency will continue to emphasize the development and enforcement of MCLs to ensure the adequacy of drinking water from public water systems. In the future, the Agency will focus on coordinating enforcement activities under a number of federal authorities so that responsible parties can be identified and required to take the actions necessary to eliminate imminent health threats. On a case by case basis, EPA will assist the states by providing funds for removal actions, including provisions of alternative drinking water, when a imminent public health threat exists.

SECTION 1: FACTORS CONSIDERED

To develop its response strategy, the Agency had to address three questions: what are the appropriate federal/state roles; what are the appropriate authorities and actions for what type of contamination; and who is liable for contamination (Figure II-20). To address these questions, several site-specific conditions must be considered, including: the type of ground water affected, the source or circumstances that resulted in contamination, and the appropriate type and degree of response needed.

The type of ground waters that have been contaminated is a critical consideration in determining both the level of concern and the authorities available to conduct or require a response action. For instance, the SDWA addresses only the contamination of public water systems, defined as those systems providing drinking water to 15 or more permanent service connections or 25 people a day for at least 60 days a year. Under the SDWA, public water systems are required to provide water satisfying drinking water standards (i.e., no contamination exceeding MCLs). Although SDWA regulations do not

Figure II-20



Response Program Issues:

- What Are the Appropriate Federal/State Roles
- What Are the Appropriate Authorities and Actions for What Type of Contamination
- Who is Liable for Contamination

apply to private wells, most states use these or their own similar standards to inform well owners of possible health risks, and in some cases, state laws may require closure of private wells that do not meet drinking water standards.

The source and circumstances of contamination at a given site is another important consideration in determining the appropriate authority for responding to contamination. Under the Comprehensive Emergency Response, Compensation and Liability Act (CERCLA), EPA has the authority to clean-up contamination and recover the cost of these actions from responsible parties. Cost-recovery, however, is specifically excluded when the contamination is a result of pesticide use in accordance with label requirements. Recovery of cost from responsible parties is a possibility, however, when contamination is a result of illegal disposal or leaks and spills.

The type and degree of response must be based on the specifics of each case. The type of response needed bears on all of the three questions -- federal/state roles, appropriate authority, and who will be liable. An initial response action can be limited to investigating the site to evaluate the extent and severity of the contamination problem. Should a site pose an immediate public health threat, corrective actions can be taken such as providing a temporary, alternative source of drinking water. Eventually more permanent solutions may have to be considered, including the establishment of long-term capacity to treat the contaminated water as it is drawn for actual use. In this regard, aquifer restoration will be a very costly, if not an impracticable, type of response when contamination is widespread.

SECTION 2: EPA's PROPOSED POSITION

EPA's response strategy will be to address the problem of ground-water contamination on a number of fronts. The Agency will exercise its own authorities and will also encourage and assist state efforts to remove imminent public health threats posed by pesticides in drinking water. Specifically, the Agency proposes the following policies:

1. <u>Where a pesticide has reached unacceptable levels in ground water, strong actions must be taken to stop further contamination. These actions can range from enforcement actions to modification of the way a pesticide is managed, including geographic restrictions on the pesticide's use.</u>

An essential part of any response action is eliminating the threat of further contamination of ground water. As discussed in the prevention section, the capacity to respond to reports of ground-water contamination must be developed. When a pesticide is initially detected in ground water, a response should include increased monitoring as well as site-specific determinations as to the extent, source and circumstances of the contamination. Enforcement actions should be taken to prevent further incidents where contamination is found to be a result of misuse. On the other hand, where contamination is the result of approved use of a pesticide, modifications in EPA's or a state's management of the pesticide must occur to minimize the likelihood of further contamination. When a pesticide level has reached or exceeded an MCL or other reference point as a result of normal agricultural use, a more aggressive stance needs to be taken, including the possibility of prohibiting further use of the pesticide in the affected areas.

When the state lacks a management plan to respond to incidents of contamination, EPA will have to decide whether to allow continued use of a pesticide in an affected area. Because the Agency has limited capacity to make site-specific decisions, its choices would most likely be made at a more aggregated level, such as a county or perhaps even an entire state. In this event, infrequent occurrences of contamination in an area may not be sufficient for EPA to undertake county-wide or state-wide cancellation of a pesticide's use. On the other hand, when repeated incidents clearly point to a ground-water threat from a registered use in an area, EPA would have to consider cancelling the use of the pesticide in an entire county or state. This situation, underscores the benefits of a state management plan in which area use decisions can be tailored to local circumstances.

2. <u>EPA will encourage a strong state role in responding to contamination. A state's management plan should consider the development of a valid corrective response scheme.</u>

Because a state is more attuned to local conditions, it should have the dominant role in ensuring that corrective actions are taken to remove any threat to its citizen's health posed by pesticide contamination of ground water. At a minimum, a state needs to take steps to identify and track ground-water contamination in order to determine if current drinking water wells will be affected and to notify users of the potential health risks. By integrating its Federal-delegated authorities and resources with its own authorities and resources, a state can provide an effective overall scheme for responding to, and where needed, correcting, public health problems resulting from pesticide contamination of ground waters. In particular, the response scheme should identify the resources and the appropriate corrective actions needed when contamination is found as a result of approved use of a pesticide.

With respect to funding for response actions, the Agency believes that states should have the lead. In establishing a corrective response capability, a state needs to select from a number of alternative mechanisms. In this regard, a number of states have already adopted or are considering funding mechanisms, such as general state revenues, a state trust fund generated by a tax on pesticide use, or a requirement for users or registrants, jointly or alone, to provide corrective actions.

EPA is also considering the development of a number of assistance measures to indirectly support states in their corrective response efforts. These measures range from site-specific and general technical assistance to providing public information and education. Table II-4 outlines some of these measures.

In summary, a state's corrective response scheme should be a key component of its pesticide management plan. The presence of such a response scheme does not, however, change the primary objective or emphasis in a state management plan from one of prevention. Recognizing that contamination is still a possibility even under the best management efforts, states should develop corrective mechanisms to respond effectively should this possibility become a

Table II-4

Indirect EPA Response Options

Technical Assistance

Site-Specific:

- Review of corrective action plans developed by State/local authorities
- Guidelines for sample analysis and data interpretation
- Development of health advisory notices

General:

- Development of pesticide fact sheet
- Development of technology transfer of treatment technology
- Development of State/local training programs for monitoring, risk assessment, and mitigation methods
- Contingency Plan guidelines
- Information on pesticide contaminations

Public Information/Education Programs

- Telephone hotline for public inquiries
- Pollution insurance information for ground water users
- Low-interest loan information for ground water users
- Press releases on contamination problems/solutions

reality. In the event that a state lacks a corrective response scheme, EPA may consider the option of denying registration, for use in that state, of pesticides that could pose major threats to ground water.

3. EPA will continue to develop and stress enforcement of MCLs. Under the SDWA's emergency powers, EPA will consider issuing orders requiring responsible parties to provide alternative water supplies when levels of pesticides present an imminent and substantial endangerment to public health.

In response to the 1986 amendments to the SDWA, EPA is accelerating the development of MCLs, particularly those for pesticides considered to be potential drinking water contaminants. Once these MCLs are finalized, the states will be able to better assess the quality of drinking water supplied by public water systems. In those cases where a public water system draws on a contaminated ground-water supply, the state must require the system to reduce contamination to acceptable levels before allowing public consumption of the water. A system may treat the water to remove the contamination, blend the water with non-contaminated water to reduce levels in delivered water, or close the well and find an alternative water supply. In some cases, it may not be feasible for a drinking water system to comply with such requirements, and states may need to close the system or provide resources to the system to comply with these requirements. Exemptions to meeting the MCL can be allowed by a state during the time it takes for a system to implement necessary corrective measures, but the system must notify its users that it is providing water with contaminants exceeding MCLs.

Under the 1986 SDWA Amendments, EPA has been given expanded authority to respond to contamination of a public drinking water system or an underground drinking water supply when it may present an imminent and substantial endangerment and when state or local authorities have not acted to protect public health. Under this expanded authority, EPA may issue orders requiring the provision of alternative water supplies by persons who caused or contributed to the endangerment. EPA will consider such action where a public system drawing on pesticide-contaminated ground water poses imminent and substantial endangerment to public health.

4. <u>EPA and the states will place greater emphasis on coordinating FIFRA, SDWA, and CERCLA enforcement activities to identify parties responsible for ground-water contamination as a result of the misuse of pesticides, including illegal disposal or leaks and spills.</u>

Under CERCLA, EPA has the authority to require corrective actions by parties responsible for ground-water contamination as a result of pesticide misuse, including illegal disposal or leaks and spills. The Agency can also recover the costs of cleaning up a site resulting from illegal disposal or leaks and spills. EPA and the states need to take advantage of the CERCLA enforcement authorities by closely coordinating their efforts under FIFRA and the SDWA with those of CERCLA.

5. <u>On a case by case basis, EPA may assist states by undertaking CERCLA Fund-financed removal actions to provide alternative drinking water supplies where there is an imminent human health threat</u>.

The Agency may consider on a case by case basis providing CERCLA Fund-financing for immediate, short-term response actions. Actions under CERCLA's Removal Program can only provide for alternative drinking water and other types of short-term responses to eliminate imminent human health threats. The Agency will seek cost-recovery when the contamination is shown to be a result of misuse and a responsible party is identified.

6. <u>The question of who should pay for long-term corrective actions at sites contaminated by the approved use of a pesticide is a legislative question. EPA believes that several aspects of the problem must be considered before a decision can be made.</u>

When contamination of ground water appears to be a result of registered use, and that use was based on sound data and reasonable efforts to predict the potential for contamination, it is not clear who should be considered the responsible party. In this situation, several parties have some involvement, including the user who applied the pesticide; the registrant who brought the pesticide to market; and EPA and state agencies who registered the product. The well-owner may even bear some responsibility if he knowingly placed his well in a high-risk setting.

EPA is not in the position to make liability decisions. This question is one to be resolved by Congress or state legislatures. When contamination is a result of use in accordance with the label, all the parties described above could be considered to have some responsibility. Liability in this situation, perhaps, should be limited to mitigating imminent public health threats with provisions for alternative drinking water or point-of-use water treatment.

Table II-5

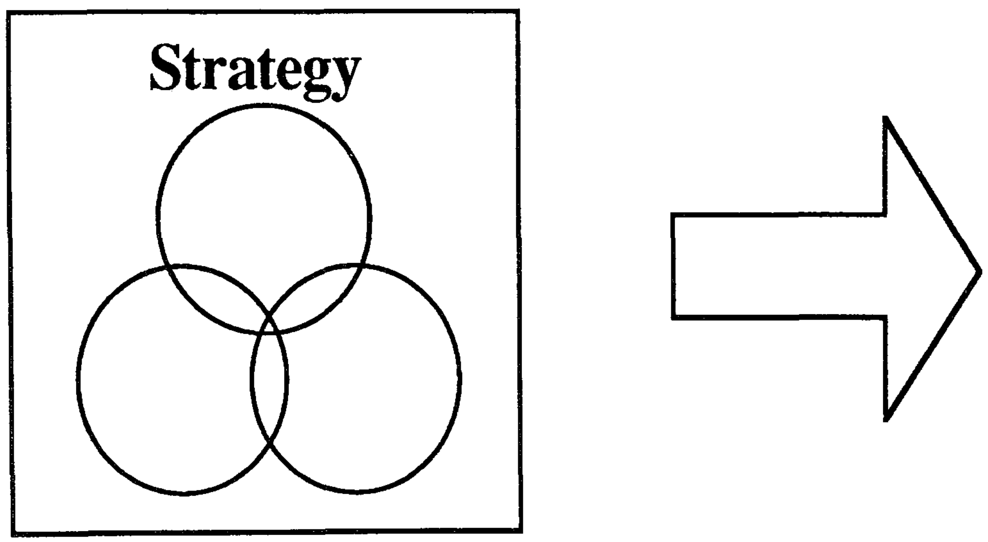
Pesticides In Ground Water
EPA's Response Strategy

EPA	STATES	LEGISLATION (FEDERAL/STATE)
Registration modification to prevent further area contamination	Modification of pesticide management plan to prevent further area contamination	
Indirect responses of technical assistance to States and public education efforts	Corrective action scheme as part of pesticide management plan; Decision on funding source for responses to imminent health threats resulting from ground water contaminated by registered pesticide use	
Case-by-case assistance to States, under CERCLA Removal Program, to address imminent public health threats primarily by providing alternative water supplies		Need to establish how response to contamination from approved pesticide use will be funded
Better coordination of enforcement activities under FIFRA, RCRA, SDWA, and CERCLA to identify responsible parties for contamination resulting from misuse including illegal disposal or leaks and spills	Better coordination of enforcement activities under FIFRA, RCRA, SDWA, and CERCLA to identify responsible parties for contamination resulting from misuse including illegal disposal or leaks and spills	

PART III

IMPLEMENTATION ISSUES

Pesticides in Ground Water Strategy



Implementation Plan (Issues)

- Working Definitions
- Detail Processes
- Priorities
- Balances Between Approaches
- Specific Criteria
- Support Mechanisms

CHAPTER 1
IMPLEMENTATION - ENVIRONMENTAL GOAL

EPA's goal is to protect the ground-water resource from pesticide contamination. Protection efforts will be differentiated based on the use and value of different ground waters. Baseline protection, at a minimum, will focus on ground waters that are a current or potential drinking water supplies. Additional measures, beyond baseline protection, may be required to provide further assurances that certain "high priority ground waters" are not threatened by such contamination.

The two key implementation issue underlying EPA's goal are: 1) the definition of potential drinking water; and 2) the definition of high priority ground water (Figure III-1).

EPA's Ground-Water Protection Strategy (GWPS) defines three basic classes of ground water:

- **Class I: Special Ground Waters** are those that both are highly vulnerable to contamination because of the hydrological characteristics of the areas under which they occur <u>and</u> characterized by either of the following two factors:

  a) Irreplaceable, in that no reasonable alternative source of drinking water is available to substantial populations; or

  b) Ecologically vital, in that the aquifer provides the base flow for a particularly sensitive ecological system that, if polluted, would destroy a unique habitat.

- **Class II: Current and Potential Sources of Drinking Water and Waters Having Other Beneficial Uses** are all other ground waters that are currently used or are potetially available for drinking water or other beneficial use.

- **Class III: Ground Waters not Considered Potential Sources of Drinking Water and of Limited Beneficial Use** are ground waters that are heavily saline, with Total Dissolved Solids (TDS) levels over 10,000 mg/l, or are otherwise contaminated beyond levels that allow cleanup using methods reasonably employed in public water system treatment. These ground waters also must not migrate to Class I or II ground waters or have a discharge to surface water that could cause degradation.

Figure III-1

Key Implementation Issue for EPA's Environmental Goal

1. Definition and Process for Identifying Potential Drinking Water

2. Definition and Process for Identifying "High Priority Ground Water"

In 1986, the Agency issued draft Guidelines for classifying ground water that further define the classes, concepts, and key terms in the GWPS and describe procedures and information needs for classifying ground water on a site-by-site basis. The Guidelines are now being revised to reflect comments received and are expected to be issued in final form this fall. The Agency intends to develop methods and procedures that are appropriate for area-wide or anticipatory classification within the next year that can be used for sources, such as pesticides, that are not suited to site-by-site classification.

More than half of the states are now developing and implementing area-wide anticipatory classification systems of their own. In addition to state classification systems, most states are expected to implement the new Wellhead Protection Program under 1986 amendments to the Safe Drinking Water Act. In this program, states will delineate protection areas around public water system wells and develop and implement management plans for controlling potential sources of contamination (including pesticides).

For the pesticide strategy, EPA hopes to be able to build upon the foundation in the EPA Ground-Water Protection Strategy and draft Guidelines, state ground-water protection strategies and anticipatory classification systems, and the Wellhead Protection Program as a means for determining where baseline and additional protection measures should apply.

1. <u>Definitions and Processes for Identifying Potential Drinking Water</u>

In some major farming areas of the country, ground water may be found very near the surface and thus be easily subject to contamination by agricultural chemicals. Such ground water could have inherent potential as a drinking water source, i.e., low salinity and sufficient yield. However, some of this water would have little, if any, potential as a source of drinking water due to its remoteness from human dwellings or the availability of preferred, alternative sources, including deeper aquifers or surface water systems. As stated in Part II, the proposed goal of this strategy is to protect ground water that is a potential, as well as current, drinking water source. Concerns have been raised that major farming dislocations could occur in some agricultural states if remote shallow aquifers with low potential as drinking water are protected in the same manner as other potential drinking water sources. Conversely, concern has also been raised that other ground waters classified as potential drinking water should receive additional protection because they are in areas of rapid population growth where demand for drinking water is expected to escalate rapidly.

Factors other than inherent drinking water potential might have to be considered when designating protected ground waters. A state may prefer to classify certain ground water in some areas as a low drinking water source because of its location in what are primarily cropping areas with no current or projected drinking water wells within a specified distance. In effect, such an approach would ease the stringency of prevention measures for certain agricultural areas with low-potential sources of future drinking water so as to continue the economic benefit of agricultural production. On the other hand, a state may want to be more protective of certain potential drinking water where rapid population growth is expected to create a high demand for drinking water in the near future. Thus, for agricultural areas, where much of the ground water will be classified as potential drinking water, the Agency is seeking comment on how to deal with the broad range of circumstances that may occur.

The Agency is seeking comments on the following specific questions:

- How serious are both of these concerns?
- How can these concerns be dealt with under the classification guidelines?
- Should subclasses be established for higher or lower levels of protection for certain high or low potential drinking waters? What should the criteria be?
- Should EPA establish criteria and/or procedures for the states to make classification decisions for agricultural areas?
- Should the criteria and/or procedures be mandatory?
- What action should EPA take if a state choses not to use a classification scheme?

2. <u>What definition and process should be used to identify "high priority ground waters"?</u>

EPA's goal is to provide differential protection to ground water based on its use and value. Specific attention will be given to protecting those waters that are a current or potential source of drinking water (i.e., Class II). Under this strategy special attention, including where necessary, additional protection measures, will be given to certain "high priority ground waters". A key issue in the implementation of this differential approach is the definition, and the process, for identifying "high priority ground waters".

One possible means of identifying "high priority ground waters" is to use the Agency's draft Guidelines for site-specific classification of ground waters. These guidelines identify "special ground waters" that are to be afforded the highest level of protection from point source contamination. These "special ground waters" are highly vulnerable to contamination and are either (1) an irreplaceable drinking water source for a substantial population or (2) ecologically-vital to unique habitats or endangered species.

Another possible option is to add to those areas with Class I ground waters, Wellhead Protection Areas (WHPAs) as the basis for defining "high priority ground waters". The 1986 SDWA amendments established the Well Head Protection (WHP) Program, which provides EPA with the authority to grant resources to a state to establish Wellhead Protection Areas (WHPA) for each public drinking water well. A WHPA is defined as the area around a public well that can impact the quality of ground water drawn by the well. Based upon Federal guidance and assistance, the states must develop and implement necessary measures to protect the water supply within WHPAs.

Another possibility is to apply the designation of "high priority ground waters" to specific areas around all drinking water wells regardless of whether they are public or private wells. Under this option, WHPAs would be used for public wells, and for private wells, a "buffer zone" or "well setback" of a specified size would be used. The advantage of this option is that it would allow for additional protection for water supplies, including private wells that are likely to be at higher risk than public wells due to their location, depth, or construction.

With regard to this second implementation issue, the Agency is soliciting comment on the following questions:

- How should the Agency define "high priority ground waters" for protection measures beyond those of baseline efforts? Should Well Head Protection Areas be included along with Class I areas?

- Should the definition include buffer zones around private wells?

- Should the states be responsible for identifying these areas using EPA criteria or their own criteria?

- Should the identification and extra protection for "high priority ground waters" be a state prerogative?

- What actions should EPA take in the event that a state is unwilling or unable to identify these areas?

CHAPTER 2
IMPLEMENTATION - PREVENTION

An important component of EPA's prevention program is a coordinated federal-state differential management approach in which the states will take the lead in making local pesticide use decisions based on local ground-water use, value, and vulnerability. The role of EPA in this management scheme will be to provide oversight, develop standards, and provide assistance to states in developing their pesticide management plans. As part of its management plan, a state will assess where there is a potential for ground-water contamination by pesticides and will implement control measures necessary to prevent or reduce the sources of such contamination. The state's pesticide management plan will also be based on meeting EPA's environmental goal of protecting the ground-water resources with specific attention given to protecting current and potential drinking water. Furthermore, MCLs or other EPA-designated protection criteria will be used as the points of reference for determining protection.

Another key component of EPA's prevention program is the establishment of effective programs for anticipatory monitoring and data analysis. To meet this need, the Agency or a state, under its management plan, will establish an "early-warning approach" in response to reports of ground-water contamination. After a pesticide is detected in ground water, the Agency or a state will apply increasingly stringent measures as the pesticide is detected at higher levels and with greater frequency.

Implementation of EPA's strategic approach for preventing ground-water contamination raises a complex web of issues. To simplify, we can group these issues into six categories: (1) Generic national control measures; (2) Barriers to a differential approach; (3) State management plans - criteria, EPA oversight/support and use; (4) Support of user decision-making; (5) Research and development priorities; and (6) Monitoring/early-warning system - mechanism and criteria (Figure III-2). The following is a discussion of these issues. At this stage in the development of its pesticide strategy, EPA is

Figure III-2

Key Implementation Issues for EPA's Prevention Program

1. Generic National Control Measures
2. Barriers to Implementing a Differential Approach
3. State Management Plans - Criteria; EPA Oversight; andSupport
4. Support of User Decision-making
5. Research and Development Priorities
6. Monitoring/Early-warning System - Mechanism and Criteria

looking for specific comments on these and other implementation issues before establishing its final strategy.

1. Generic National Control Measures

For pesticides that pose a widespread and serious threat to ground water, the Agency will continue to take national control measures, such as cancellations or suspensions, to protect the ground-water resource. The Agency will also continue to develop generic preventive measures for mitigating ground-water contamination as a result of agricultural practices. With respect to this latter area, the Agency has initiated rulemaking to restrict the use of ground-water contaminating pesticides to certified applicators and has initiated a generic labeling requirement for chemigation. In addition, EPA has initiated a project to examine how various agricultural practices contribute to ground-water contamination.

Some of the questions which are raised are:

- What agricultural practices can be regulated effectively through generic national regulations? How should these practices be regulated? Through labeling?
- What types of disposal measures can be addressed at the national level? (FIFRA or RCRA?)
- How should the states and USDA be involved in the development of national control measures?

2. Barriers to Implementation of a Differential Approach

In the past, EPA has taken a uniform national approach in making its pesticide management decisions. Only recently has the Agency begun to address concerns, such as endangered species, which require a more localized management approach. Similar to the problem of protecting endangered species, the pesticides in ground-water concern will require a differential management approach. However, there are a number of important differences which make the management of the ground-water problem more difficult to implement than the endangered species protection efforts. Whereas endangered species protection requirements are primarily limited to geographically defined usage bans, ground-water protection measures will include both usage bans and use modifications. Without extensive state involvement, a pesticide user would be responsible for complying both with minimum county or state-wide measures and with special, more stringent measures for site-specific high vulnerability or high risk situations (e.g., close proximity to drinking water wells). The user must determine if his pesticide application site falls into this situation.

Before developing its final differential management approach, EPA is seeking comments on the following implementation questions:

- What types of control measures should EPA consider for differential prevention based on local conditions? Should EPA consider such measures as changes in the rate, timing, and method of application or other farming practices that could influence pesticide movement to ground water? Should the user be required to determine the applicability of "measures" based on site-specific conditions? What types of measures should be considered as special site-specific requirements?

- What are the possible labeling approaches for minimum county or state-wide prevention measures? How should information be provided to the user to determine applicability of additional special measures to his usage area - through labeling, supplemental labeling, and/or training?

- How can a county-by-county differential approach be enforced? How can additional special measures be enforced? What are the barriers? How can they be overcome? Will users understand and cooperate with a differential approach?

2. State Management Plans - Criteria, EPA Oversight, and Support

The variability of the ground-water resource dictates that the states must play a dominant role in managing pesticide use within their boundaries. Through the development of state-specific management plans, the states can tailor prevention measures to their local conditions. EPA will take the state management plan into consideration in making its pesticide registration decisions. In fact, EPA may cancel a pesticide use because of ground-water concerns in those states that lack an adequate management plan.

Numerous implementation issues are associated with such a federal/state management effort, including:

- What criteria should EPA use to determine the adequacy of a state management plan? Should EPA review specific state decisions on classifying ground waters, determining prevention measures, or conducting monitoring? Or, should EPA limit its review to a state's general capability by assessing such factors as legislative authority, committed resources, political barriers, technical expertise, and administrative capability? Or, should EPA review the actual plan?

- Should EPA develop specific requirements or should only guidelines be established for the states to follow in developing their management plans? What basic types of criteria should be developed: vulnerability classification; use and value classifications (including the definition of "high-priority ground water"); or prevention measures for specific ground water conditions? Should state management plans focus on implementing EPA requirements at a higher level of resolution (i.e., sub-county instead of county-level)? To what degree should a state have the flexibility to develop alternative measures, including non-regulatory approaches such as user education and training? Under what conditions would the state have maximum flexibility?

- What actions should EPA take when a state's management plan is inadequate or nonexistent? What types of monitoring data would indicate that an existing state management plan is inadequate? What other factors should be considered?

- How should pesticide labeling be used to reflect federal/state protective measures? Is supplemental labeling or user training the best way to communicate detailed local requirements? What other alternatives are available?

- What level of resources are needed by a state to develop management plans? Are most states currently funding or considering funding pesticide management programs to protect ground water?

- How can a state coordinate the development of a management plan among its various agencies? How can the Federal government stimulate coordination within a state and among several states when contamination crosses state borders?

3. <u>Support of User Decision-Making</u>

The user is in the unique position of directly controlling the use of a pesticide in the field. The proper use of a pesticide will depend largely on the user's understanding and ability to carry out directions which are specified on the label or provided by other means. Instructions that clearly dictate exactly where a pesticide can and cannot be used, based on familiar geographic landmarks or boundaries, are the most easily implemented requirements, particularly if a map is provided.

However, this level of detail is not feasible on a national scale. As a consequence, the user may have to assess the applicability of certain prevention measures based on a number of site-specific conditions, including the proximity of wells, the depth to ground water, or the type of soil at the site of application. These decisions may sometimes be difficult for users to make, but they are critical for an effective ground-water protection program. As part of its strategy, EPA proposes to provide better technical information to users for making these types of decisions. Some of the questions which are associated with meeting this objective include:

- How can the Federal government (e.g., EPA, USDA) and the states effectively transmit information to users? Are there ways to eliminate or reduce any liability concerns?
- How can certification and training programs assist the user in making decisions that would affect ground water in his area?
- How can registrants assist the user with regard to proper use of a pesticide? Should EPA and the states require registrants to provide technical assistance to users?

4. Research and Development Priorities

Recognizing that research is an essential element of EPA's efforts to protect ground water, the Agency asked its Science Advisory Board (SAB) on July 10, 1984, to review the Agency's ground-water research program. An executive committee of the SAB summarized the current status of ground-water research activities and presented a number of recommendations for increased attention as well as new initiatives for research. Some of the SAB's recommendations include options pertaining to agricultural chemicals in ground water. Since the issuance of the SAB's report, EPA's Office of Research and Development has initiated a number of ground-water research program reviews to explore ground-water research priorities and to develop a more coordinated program within the Agency, as well as with other Federal and state agencies.

The Agency would like to build on the results of the SAB's report and the Agency's efforts to improve its ground-water research programs by seeking comments on the following issues:

- **Monitoring:** What steps should EPA take to enhance the development of ground-water sampling and analytical methods? How can the development of these techniques be coordinated with USGS? What type of quality assurance/quality control procedures are needed? How can EPA determine the effectiveness of state monitoring capabilities?

- **Fate and Transport:** What types of research should the Agency conduct/sponsor to predict the fate and transport of pesticides in ground water? How effective are current ground-water models in evaluating pesticide behavior in ground water due to physical-chemical processes? How can EPA improve its program of field evaluation of prediction techniques?

- **Risk Assessment:** What types of research studies would best enable the Agency to assess potential risk from pesticides in ground water? Should the Agency develop risk scenarios for populations dependent on public vs. private water supplies?

- **Technology Transfer and Technical Assistance:** How can the Agency coordinate the transfer of research data within EPA and with other Federal and State agencies? How can the Federal government and the states get information to the users? Is there a need for a national training center?

- **Agricultural Practices:** What types of research on agricultural practices are needed? Should this type of research be conducted by EPA, USDA, or registrants?

- **Disposal and Leaks and Spills Technology:** What types of research are needed to improve pesticide disposal technology? Who should fund it? Is research needed to improve containment practices for preventing leaks and spills of pesticides? If so, what types of methods should be examined?

5. <u>Monitoring and Early-Warning System -- Mechanism and Criteria</u>

A key element of the prevention strategy is the development of an anticipatory monitoring system to identify emerging problems and to assess the success of pesticide management plans. A number of implementation questions, however, need to be addressed regarding this element of the strategy, particularly in regard to the concept of an "early warning" or "yellow light/red light" approach.

- Based on monitoring data, when should the Agency or states change the management of a pesticide's use within an area? At what levels and frequency of reported contamination should action be taken?

- Is it necessary first to determine the cause of contamination before changing the management of a pesticide use?

CHAPTER 3
IMPLEMENTATION - RESPONSE

In responding to pesticide contamination of ground water, the Federal government, states, and local governments must coordinate their actions, with the states taking the lead role. Acting together, they must establish the mechanisms to stop further contamination quickly in an area where pesticide concentrations in ground water have reached unacceptable levels. Under its pesticide management plan, a state can tailor pesticide management more precisely than EPA. However, when a state fails to respond, the Agency will take regulatory action for an entire county or even a state, if necessary, to remove the threat of further contamination.

As a key component of its pesticide management plan, a state should develop a corrective response scheme and determine the best mechanism for supporting corrective actions for contamination resulting from pesticide use in accordance with label directions. Working with the states, EPA will coordinate FIFRA, SDWA, and CERCLA enforcement activities to identify responsible parties who must correct ground-water contamination problems resulting from pesticide misuse. EPA will continue to develop MCLs for pesticides, which the state will use to ensure that public water systems are not supplying drinking water with unacceptable levels of pesticide contamination. On a case-by-case basis, EPA will assist the states through Superfund removal actions. These removal actions will focus largely on providing alternative water supplies or other immediate actions to remove imminent public health threats.

Key implementation questions for the Agency's response strategy include (Figure III-3):

- When would it be appropriate for EPA to consider not registering a pesticide in a state that does not have a corrective action scheme?
- What indirect EPA responses, including technical assistance to the states or national public information and educational efforts (see Table III-1), should be a priority for development?

Figure III-3

Key Implementation Issues for EPA's Response Program

1. Considerations for EPA to Register a Pesticide in a State that Does Not Have a Corrective Action Scheme

2. Indirect EPA Responses that Should Be a Priority for Development

3. What Can Be Done to Facilitate Coordination of Enforcement Activities Under FIFRA, RCRA, SDWA, and CERCLA

4. When Should EPA Consider Assisting a State Under EPA's CERCLA Removal Program, and What Criteria Should Define an Imminent Health Threat

Table III-1

Indirect EPA Response Options

Technical Assistance

Site-Specific:

- Review of corrective action plans developed by State/local authorities
- Guidelines for sample analysis and data interpretation
- Development of health advisory notices

General:

- Development of pesticide fact sheet
- Development of technology transfer of treatment technology
- Development of State/local training programs for monitoring, risk assessment, and mitigation methods
- Contingency Plan guidelines
- Information on pesticide contaminations

Public Information/Education Programs

- Telephone hotline for public inquiries
- Pollution insurance information for ground water users
- Low-interest loan information for ground water users
- Press releases on contamination problems/solutions

- What can be done to facilitate coordination of enforcement activities under FIFRA, RCRA, SDWA, and CERCLA to identify parties responsible for contamination resulting from misuse, such as illegal disposal or leaks and spills?

- When should EPA consider assisting a state under the Agency's CERCLA removal program? What should be the criteria for defining an imminent health threat resulting from pesticide contamination of drinking water?