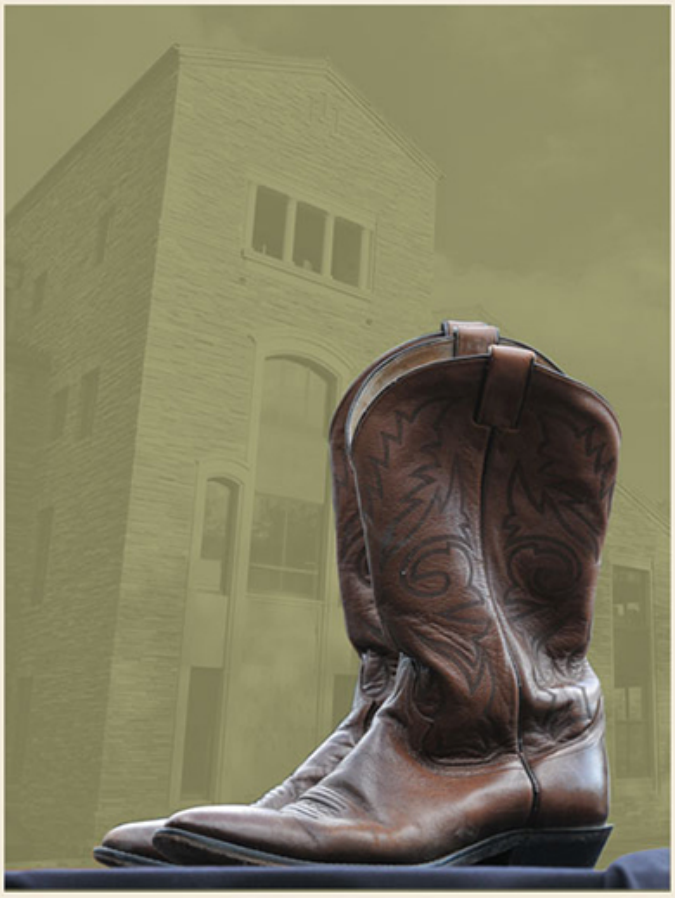
1989

Groundwater Quality Protection: Setting a National Goal for State and Federal Programs

David H. Getches
University of Colorado Law School



David H. Getches, *Groundwater Quality Protection: Setting a National Goal for State and Federal Programs*, 65 CHI.-KENT L. REV. 387 (1989).

GROUNDWATER QUALITY PROTECTION: SETTING A NATIONAL GOAL FOR STATE AND FEDERAL PROGRAMS

DAVID H. GETCHES*

Concern for groundwater problems leads the current wave of public environmental consciousness. Reactions to long-hidden threats to the health of present and unborn generations resemble the environmental fervor that swept the country almost thirty years ago. But the quest for solutions to today's great unsolved pollution issue, groundwater contamination, is frustrated by the greater technical complexity and by the heightened controversy over how to allocate political responsibility for control programs. The federal leadership that was conceded in other pollution programs is less clear because the types of groundwater regulation that are most needed fall within the realm of traditional state and local responsibility. Other regulatory measures clearly belong with the federal government and many are in place, though they are rarely specified as groundwater protection measures.

A national consensus favors action to protect groundwater quality, but there is a preoccupation with whether programs should be initiated and run by the federal government or by state and local authorities. Striking a federal-state balance has been an issue in all environmental control programs. The issue is particularly troublesome where many sources require national attention and standards, yet the resource to be protected is essentially local. Add to this the fact that protection of the resource is complex and expensive enough to require national attention, ingenuity and spending to support the exercise of state and local prerogatives over land use and water allocation.

A true federal-state effort is needed, calling on each sovereign to perform fully the functions it does most effectively and efficiently. Congress should enact legislation to facilitate state groundwater protection programs and to define better the federal role in ensuring the groundwater quality. This principle requires strengthened federal responsibility for nationally uniform regulatory programs where they are most appro-

* Professor of Law, University of Colorado School of Law. The author gratefully acknowledges the assistance of Ellen Ostheimer Creagar and Richard Poulin, and of Professor Lawrence J. MacDonnell who presented the paper at the Great Lakes Groundwater Quality Symposium, Chicago-Kent College of Law, September 8, 1989.

priate, such as in controlling point sources and the manufacture, distribution and use of certain pollutants like pesticides. On the other hand, states should have great latitude in designing and carrying out programs to regulate, protect and manage their natural resources—aquifers and the surrounding lands. But they will need substantial federal financial incentives and technical assistance. The components of the approach suggested here resemble aspects of other recent proposals. The difference is that others tend to stress either a strong federal regulatory presence or broad deference to states. I believe that it is not an "either-or" proposition, but that federal legislation is necessary.

The elements Congress should include in national groundwater legislation are:

1. A forceful statement of national policy to protect groundwater resources by using an optimum combination of federal and state efforts; it would expand the mission of all federal statutes and agencies accordingly;
2. A well-coordinated groundwater research program;
3. Amendments to existing federal statutes that control aspects of groundwater quality to expand and coordinate those programs, but not to add major new programs;
4. Development of non-mandatory state Aquifer Protection Strategies to set standards and define the methods for managing individual aquifers, using all available state devices including land use and water laws; federal incentives would induce state satisfaction of flexible guidelines;
5. Significant federal technical assistance and funding to support federal programs and to promote state Aquifer Protection Strategies.

I. THE ERA OF ENVIRONMENTAL LEGISLATION

A. The Rise of Environmental Consciousness

In the 1960s and 1970s politicians responded forcefully to a tide of public opinion calling for control of pollution that had reached unacceptable levels. Air pollution had worsened in industrial cities after World War II and a health threat was becoming apparent. One three-day episode of industrial air pollution at Donora, Pennsylvania made 5,910 people ill and accounted for 20 deaths.[1] Barry Commoner warned that the Great Lakes were dying[2] and the Cuyahoga River, laden with volatile

1. R. STEWART & J. KRIER, ENVIRONMENTAL LAW AND POLICY 8 (2d ed. 1978).
2. B. COMMONER, THE CLOSING CIRCLE 107 (1971).

chemicals, burst into flames.[3] As environmental organizations gained broad popular support, they were able to put organized pressure on government, lawmakers and polluters.[4]

Within the space of only a few years, far-reaching federal environmental statutes were passed and older, rather ineffectual, laws were toughened.[5] Federal agencies, states, environmental organizations and those who were the targets of regulation were fully occupied with fulfilling the regulatory missions charted by the new laws. A delicate if not comfortable intergovernmental balance of power was achieved. National standards were set and were to be enforced through nationally uniform regulatory programs administered by the states. The ambitious new programs were designed to clean up the nation's air, rivers and oceans, a task more difficult and costly than Congress anticipated. Extensions, exceptions and revised goals were necessary, but today most everyone believes that the environment is better for the efforts that were made.

Congress ushered in the era of environmental legislation with the National Environmental Policy Act of 1969 (NEPA),[6] setting sweeping policy goals such as encouraging "productive and enjoyable harmony between man and his environment" and promoting "efforts which will prevent or eliminate damage to the environment and biosphere . . . ."[7] Even as the nation made progress toward the lofty objectives of NEPA, the Clean Air Act,[8] Clean Water Act[9] and other components of the era of

3. L. HINES, ENVIRONMENTAL ISSUES: POPULATION, POLLUTION, AND ECONOMICS 195 (1973).

4. The rise of environmentalism is chronicled with insight and modesty in S. UDALL, THE QUIET CRISIS AND THE NEXT GENERATION (1988).

5. The first major wave of environmental legislation included the amendments to the Federal Water Pollution Control Act of 1972 (now known as the Clean Water Act), 33 U.S.C. §§ 1251-1387; the Safe Drinking Water Act of 1974 (SDWA), 42 U.S.C. §§ 300f-300j-10; the Solid Waste Disposal Act of 1976 (now known as the Resource Conservation and Recovery Act (RCRA)), 42 U.S.C. §§ 6901-6987; the Toxic Substances Control Act of 1976 (TSCA), 15 U.S.C. §§ 2601-2671; the Surface Mining Control and Reclamation Act of 1977, 30 U.S.C. §§ 1201-1328e; and the Clean Air Act, 42 U.S.C. §§ 7401-7626. A host of environmental statutes designed to protect the federal public lands and resources was also enacted in the same period. *See, e.g.*, National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. §§ 4321-4370a; Marine Mammal Protection Act of 1972, 16 U.S.C. §§ 1361-1407; Marine Protection, Research and Sanctuaries Act of 1972, 16 U.S.C. §§ 1431-1445; 33 U.S.C. §§ 1401-1445; Coastal Zone Management Act of 1972, 16 U.S.C. §§ 1451-1464; Endangered Species Act of 1973, 16 U.S.C. §§ 1531-1544; National Wild and Scenic Rivers Act of 1973, 16 U.S.C. §§ 1271-1287; National Forest Management Act of 1976 (NFMA), 16 U.S.C. §§ 1600-1687; Federal Land Policy and Management Act of 1976 (FLPMA), 43 U.S.C. §§ 1701-1784; Mining in the National Parks Act of 1976, 16 U.S.C. §§ 1901-1912d; Public Rangelands Improvement Act of 1978 (PRIA), 43 U.S.C. §§ 1901-1908.

6. 42 U.S.C. §§ 4321-4370a.

7. 42 U.S.C. § 4321.

8. 42 U.S.C. § 7401 (1982) ("to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population").

9. 33 U.S.C. § 1251 (1982) ("to restore and maintain the chemical, physical, and biological integrity of the Nation's waters").

environmental law reform,[10] it was apparent that some parts of the environment, especially groundwater resources, were escaping protection.[11] Groundwater protection was avoided in part because of the practical difficulties in knowing about it, let alone controlling it. It was long considered a "hidden" resource beyond the reach or understanding of most mortals.[12] Even with the benefit of modern science there are complexities that press the limits of available technology.

Groundwater is, quite literally, the end of the line. It suffers the collective consequences of residual contaminants from all other parts of the environment. Lack of vigilance in manufacturing or using chemicals threatens to deteriorate groundwater with poisons that seep into or run off the ground. "Sanitary landfills" containing old paints, household chemicals and industrial wastes remain covered and forgotten until their secrets begin to leak into aquifers. Even triumphs in controlling air and water pollution have been tarnished by discoveries that buried sludge from sewage treatment plants and from expensive "scrubbers" that remove smokestack air pollutants can contaminate groundwater. Runoff from city streets, agricultural chemicals applied to crops and seepage around mine sites all find their way into underground waters. Perhaps all these results seem predictable. Nevertheless, we did ignore the potential problems for many years while attacking other difficult but more obvious threats to health and welfare. Only when health hazards were vividly shown in the crises of some communities was the need for action to protect groundwater widely conceded.

Rachel Carson's 1960 work, *Silent Spring*, warned that modern technology was producing toxic detritus and endangering society in the name of "progress."[13] Some saw the book as prophetic, but not enough to force protective action. Poisonous wastes continued to be hidden un-

10. *E.g.*, 42 U.S.C. § 6902 (1982) ("to promote the protection of health and the environment and to conserve valuable material and energy resources").

11. *See* Comment, *Arizona's Coming Dilemma: Water Supply and Population Growth*, 2 ECOLOGY L.Q. 357 (1972); Heyman, Quarles Jr., Sive & Cutler, *Challenge of Environmental Controls*, 28 BUS. LAW. 9 (1973); Commoner, *A Current Problem in the Environmental Crisis, Mercury Pollution, and Its Legal Implications*, 4 NAT. RESOURCES LAW. 139 (1971); Note, *Ground Waters: Are They Beneath the Reach of the Federal Water Pollution Control Act Amendments*? 5 ENVTL. AFF. 545 (1976); Harris, *Environmental Law: A Private or Governmental Responsibility*? 3 NAT. RESOURCES LAW. 710 (1970); Klipsch, *Aspects of Constitutional Right to a Habitable Environment: Towards an Environmental Due Process*, 49 IND. L.J. 203 (1974); Krieger, *Environmental Impact of Water: The Best and Worst of Times*, 19 ROCKY MTN. MIN. L. INST. 555 (1974); Reed, *Compatible Environmental Change: A New Priority*? 4 ENVTL. L. 1 (1973); Note, *Tilting the Environmental Windmill — The Quest for a Substantive Right to a Clean Environment*, 9 SUFFOLK U.L. REV. 1286 (1975).

12. Over the years courts have found groundwaters "secret, changeable and uncontrollable" and not susceptible to legal control. Chatfield v. Wilson, 28 Vt. 49, 53 (1855); Frazier v. Brown, 12 Ohio St. 294 (1961); Nelson v. C & C Plywood Corp., 154 Mont. 414, 465 P.2d 314 (1970).

13. R. CARSON, SILENT SPRING (1960).

derground, secretly contaminating waters and soils. Any doubts about Carson's prescience were erased after the odors and ooze of thousands of gallons of sickening waste rose from a New Jersey schoolyard into the sight and senses of the public in 1976. This was twenty-four years after Hooker Chemical Co.'s apparently generous donation to a school district of land overlying the company's old waste disposal site known, ironically, as "Love Canal."[14] The disaster solved the mystery of two generations of sick and disabled children in that community. It created new mysteries as to how to reclaim the soils and waters of the area and how to prevent other Love Canals. Soon the public discovered that almost every community had its own present or potential crisis of contaminated or threatened groundwater.

B. Groundwater: Issue of the Eighties

The nation's heavy dependence on groundwater was expanding even as gaps in protection of groundwater quality became more obvious. Almost a quarter of all the water used in the United States is groundwater,[15] and the percentage is increasing. From 1945 until 1980 groundwater use more than quadrupled, increasing from 21 billion to 88 billion gallons a day.[16] In the United States more than half of the population relies on groundwater.[17]

By the mid-1970s Congress and the Environmental Protection Agency (EPA) had begun to address gaps in coverage in federal environmental laws. It passed new laws or expansive amendments regulating the quality of underground drinking water supplies,[18] regulating solid and hazardous waste disposal,[19] cleaning up old hazardous waste sites,[20] controlling production of toxic substances[21] and pesticides,[22] and strengthening control of nonpoint source pollutant discharges.[23] States also have

14. *See, e.g.*, Comment, *Establishing Liability for the Damages from Hazardous Wastes: An Alternative Route for Love Canal Plaintiffs*, 31 CATH. U.L. REV. 273, 279 (1982) (Hooker Chemical deeded the property to the Niagara Board of Education "for one dollar consideration, with a proviso disclaiming liability for any injuries from the chemicals"); S. Wolf, *Hazardous Waste Trials and Tribulations*, 13 ENVTL. L. 367, 403-07 (1983).

15. Of all the available fresh water in the United States about ninety percent lies underground. Z. SMITH, GROUNDWATER IN THE WEST 4 (1989).

16. W. GORDON, A CITIZEN'S HANDBOOK ON GROUNDWATER PROTECTION 11 (1984).

17. 13 Env't Rep. (BNA) 290, 291 (1982).

18. The Safe Drinking Water Act of 1974 (SDWA), 42 U.S.C. §§ 300f-300j-10.

19. Resource Conservation and Recovery Act of 1976 (RCRA), 42 U.S.C. §§ 6901-6987.

20. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (Superfund), 42 U.S.C. §§ 9601-9675.

21. Toxic Substances Control Act of 1976 (TSCA), 15 U.S.C. §§ 2601-2671.

22. Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 U.S.C. §§ 136-136y (1982).

23. 33 U.S.C. § 1329 (1987).

begun to develop a variety of programs to cope with special problems that were neglected by the federal government in its pollution control programs. Both federal and state governments responded to specific problems by modifying or amending existing programs and agencies.

Taken together, these responses were not adequate.[24] Nor were they organized legislatively or administratively under the rubric of "groundwater." In 1983, the Department of the Interior found forty-four general groundwater programs scattered about several departments.[25] A U.S. EPA report listed some 270 groundwater contamination programs in that agency alone.[26] State efforts are also divided among several agencies and programs. A state may regulate well drilling through a water allocation agency, pesticide application through an agriculture department, waste dumps through local governments, deep well injection through an oil and gas regulatory agency, mine runoff through a minerals board and so on.

One of the greatest impediments to effective groundwater protection is the complexity of the problem. Consider the diverse sources of contamination. Groundwater quality is affected by above ground discharges of industrial waste, leaking underground storage tanks, seepage of pesticides from farmlands, runoff from mine sites, active and inactive waste dumps, deep well waste injection, septic tanks, leaks and spills on the ground, road salts, urban runoff and salt water intrusion from oceans. Consider also the diverse kinds of aquifers.[27] Some lie just beneath the land's surface; some are thousands of feet deep. It will take centuries or longer for some to refill if they are pumped; others are essentially the base flow of surface streams. Some are absolutely pure; others are naturally brackish or tainted. And the uses of groundwater in different states and regions vary widely, too.[28]

The multiplicity of sources and types of groundwater contamination problems, as well as the varied but increasing importance of groundwater

24. One commentator observed, "Groundwater protection forces regulators to design strategies to control largely unknown types and numbers of sources in order to control largely unknown problems." Gilbert, *Groundwater Contamination: Pollutants, Priorities, and the Pursuit of Sensible Regulation*, 32 ROCKY MTN. MIN. L. INST. 2-1, 2-7 (1987).

25. U.S. DEP'T OF THE INTERIOR, DIRECTORY OF GROUNDWATER PROGRAMS (1983).

26. U.S. ENVIRONMENTAL PROTECTION AGENCY, EPA ACTIVITIES RELATED TO SOURCES OF GROUND-WATER CONTAMINATION (1987).

27. An excellent overview of the groundwater resources of the several states is found in U. S. GEOLOGICAL SURVEY, NATIONAL WATER SUMMARY 1984, WATER-SUPPLY PAPER 2275, at 118-458 (1985).

28. *Id.* The U. S. Geological Survey reports that state usages of groundwater for irrigation varies from 0%-100% and averages 40%, and for public water supply varies from 0%-94% and averages 35%. Percentages of population of the states who are served by groundwater vary from 15%-95% and average 54%. *Id.* at 120.

use, call for a combination of responses. Reduction of the amounts of wastes produced requires a top to bottom fundamental examination of manufacturing processes and uses of chemicals. Then it is necessary to look at specific sources that can be controlled at a point of discharge. Some substances are inherently hazardous and need to be controlled in their manufacture, distribution and use. Many sources are inextricably linked to the nature of activities that take place on overlying land. Others require regulation of groundwater wells to control the amounts, timing and location of pumping. Besides preventive measures, it may be necessary to clean up aquifers that are already contaminated. The federal response has been strong in some respects, weak or nonexistent in others and uncoordinated in all.

Commentators have criticized federal laws and programs dealing with groundwater as "a patchwork," "fragmented," "inadequate," "piecemeal" and "uncoordinated."[29] At the insistence of Congress, EPA made several attempts to give coherence to the potpourri of programs that touched groundwater. Recognizing that the quality of groundwater "looms as a major issue for the 1980s," the agency adopted a "Ground-Water Protection Strategy" in 1984.[30] The policy document acknowledged a federal purpose of protecting groundwater, but limited the United States' role to coordinating, without adding to, present statutory programs. The policy said the federal government should encourage voluntary state programs, letting state and local governments take the "lead role" in deference to their exclusive prerogative in water allocation and use.[31] Importantly, the document conceded that some aquifers need less than complete protection so that they can be degraded to pollutant levels that are consistent with existing and future uses. Thus, the Strategy offered a three-tiered classification system based on the kinds of uses appropriate for particular aquifers.[32]

The Strategy document has much to commend it in theory but it has not made a major change in practice. Governmental responses to

29. *E.g.*, Getches, *Controlling Groundwater Use and Quality: A Fragmented System*, 17 NAT. RESOURCES LAW. 623 (1985); Note, *A DRASTIC Approach to Controlling Ground-Water Pollution*, 98 YALE L.J. 773, 779 (1989).

30. OFFICE OF GROUND-WATER PROTECTION, U.S. EPA, GROUND-WATER PROTECTION STRATEGY (1984); Henderson, *The Institutional Framework for Protecting Groundwater in the United States*, in PLANNING FOR GROUNDWATER PROTECTION 44, 60-63 (G. Page ed. 1987). An account of the political events leading up to promulgation of the Strategy and a thoughtful critique of the nearly final draft of the document that was adopted is found in Dycus, *Development of a National Groundwater Protection Policy*, 11 B. C. ENVTL. AFF. L. REV. 211 (1984). See comments on a later draft in Getches, *supra* note 29, at 640-43.

31. *See* Dycus, *supra* note 30, at 219.

32. *Id.* at 234.

groundwater contamination problems remain incomplete. It is increasingly apparent that congressional action is needed.

The consequence of incomplete and unfocused protection efforts is the continuing loss of groundwater resources. Many commentators argue that a concerted groundwater program is needed. Though they may differ on the components of such a program, industry, environmentalists and others all have called on the federal government to adopt a coordinated approach to groundwater.[33] This has resulted so far only in the administratively-developed EPA Strategy[34] and several legislative proposals.

II. TOWARD FEDERAL GROUNDWATER LEGISLATION

In the past few years, books, reports, articles and conferences have recommended federal legislation to promote better and more coordinated groundwater quality programs.[35] They each suggest different legislative approaches. At least ten groundwater bills have been introduced in the last three Congresses. They range from major new federal regulatory programs to modest programs for orderly federal groundwater research.

This paper takes the view, shared by many others, that effective groundwater quality protection will not be possible without federal leadership. Some sources of groundwater contamination must be addressed on a national scale. Yet for groundwater protection programs to succeed, they must include aquifer protection components designed and carried out by individual states. Thus, states must not simply have "primacy" in administering a federally mandated and structured program, but must craft their own programs that fit specific situations of the

33. The National Water Alliance, an organization of congressional leaders and representatives of industry, environmental groups and other organizations that favor a national water policy, put groundwater issues at the top of its 1989 agenda and urged the administration "to develop a comprehensive groundwater policy." NATIONAL WATER ALLIANCE, WATER: TODAY'S AGENDA, A CHALLENGE FOR THE PRESIDENT AND CONGRESS ix (1989).

34. *See supra* note 30 and accompanying text.

35. *E.g.*, CONSERVATION FOUNDATION, GROUNDWATER PROTECTION (1987); R. GLICKSMAN, FEDERAL GROUNDWATER QUALITY CONTROL LAW AND POLICY (1988) (proceedings of the Natural Resources Law Center conference on Water Quality Control: "Integrating Beneficial Use and Environmental Protection"); ENVTL. & ENERGY STUDY INST., A CONGRESSIONAL AGENDA TO PREVENT GROUNDWATER CONTAMINATION: BUILDING CAPACITY TO MEET PROTECTION NEEDS (1986); Fort, *Federalism and the Prevention of Groundwater Contamination*,—WATER RESOURCES—(1990 forthcoming); Coggins & Glicksman, *Groundwater Pollution I: The Problem and the Law*, 35 U. KAN. L. REV. 75 (1986); Durenberger, *Groundwater Policy: A Need for Federal Participation*, F. FOR APPLIED RESEARCH & PUBLIC POLICY 79-86 (1987); Dycus, *supra* note 30, at 211-71; Manley, *Federalism and the Management of the Environment*, 19 URB. LAW. 661-81 (1987); SIERRA CLUB LEGAL DEFENSE FUND, THE POISONED WELL 132 (1989); *To Assess Progress Toward the Development of a National Groundwater Protection Program: Hearing before the Subcomm. on Environment, Energy and Natural Resources*, 99th Cong., 1st Sess. (1987).

resources being protected in each case. The usual kind of shared responsibility, seen in the models of the Clean Water Act, Clean Air Act, Resources Conservation and Recovery Act and a host of other federal environmental laws, is a federal framework in which federal standards are applied and administered by state agencies. Different models are appropriate in protecting groundwater, especially in the area of aquifer management which requires localized attention. States also need federal financial assistance to help them overcome technical, financial and political constraints.

There is no question that Congress has the constitutional power to control virtually every aspect of pollution because of the potential effects on interstate commerce.[36] The Supreme Court has specifically noted the national interest and national power to deal with groundwater.[37] But in pollution control, the issue has always been one of policy, not of power: whether federal action was necessary and whether it was the most effective way to deal with the problem. The need for a federal role in protecting groundwater, however, is far different from the needs that motivated the United States to address water pollution generally. In the case of industrial and municipal discharges of pollutants into the nation's waterways good policy dictated federal action. States were tempted to induce polluting businesses to locate within their borders to create jobs and economic growth. Where this resulted in water pollution, the degraded rivers usually flowed out of state to be someone else's problem. Consequently, states were slow to act against polluters.

Groundwater quality control problems raise more complex problems calling for more diverse and flexible responses. The multiple and very different causes of groundwater contamination require a variety of programs. Some problems can be addressed by state administration of federally-prescribed programs. Thus, the Clean Water Act model is appropriate for controlling point sources of groundwater, as well as surface water, pollution. Particular types of contaminants are most effectively controlled at the stages of manufacture and distribution. Federal programs now deal with some substances in this way. The Toxic Substances Control Act (TSCA) is the best example of a federal statute that can

36. Hodel v. Virginia Surface Mining & Reclamation Ass'n, 452 U.S. 264, 282 (1981) overruled on other grounds by Garcia v. San Antonio Metro. Transit Auth. 469 U.S. 528 (1985). Congress' power to legislate to protect health and welfare has also been cited as a ground for federal legislation. United States v. Ashland Oil & Transp. Co., 504 F.2d 1317 (6th Cir. 1974). Although it is less likely that pollution of an aquifer will cross state lines than pollution of a surface stream, many sources of groundwater contamination are engaged in interstate commerce (e.g., waste disposal, widespread storage tanks, waste injection wells). *See* Henderson, *supra* note 30, at 33.

37. Sporhase v. Nebraska *ex rel.* Douglas, 458 U.S. 941 (1982).

protect groundwater in this way.[38] Congress has charged the EPA with regulating manufacturers who distribute identified substances in interstate commerce. The agency can regulate potency, labeling, packaging, prescribed uses and methods of shipping.

Some threats to groundwater are not susceptible to control under either state-administered federal programs (Clean Water Act model) or direct federal regulatory programs (TSCA model). In particular, there is a need for specific aquifer protection. Neither of the federal regulatory models focuses especially on the resource. Generalizations about groundwater are unhelpful in designing a rational regulatory program. Programs must be carefully tailored to particular aquifers because of differences in hydrology, present causes and future threats of contamination, and existing and proposed uses. The lack of effective aquifer protection and management strategies is the most serious unsolved problem in groundwater protection.

States have also begun to pursue important and aggressive programs of their own. These current state efforts in groundwater are more significant than the programs states had initiated to deal with air, water and other pollution problems before the federal government entered the field decisively in the 1970s. States have been moved to act in part by a knowledge that polluted groundwater is a destroyed or degraded resource that will remain their problem in perpetuity. But it is clear that federal financial and technical assistance is needed if they are to succeed.

A. The Clean Water Act Filled a National Need

When the 1972 Amendments to the Clean Water Act (then the Federal Water Pollution Control Act) were passed, the states had utterly failed to address the water pollution issue. The gentle nudge introduced into federal law in the Act's 1948 predecessor had not been enough to move the states.[39] A system of subsidies for state and local governments with no direct federal regulation resulted in ineffective and uneven state efforts.[40]

When it became clear that this approach was not working, Congress amended the Act in 1965 to require state regulation or else the federal government would step in to regulate.[41] But the new framework was

38. 15 U.S.C. § 2601 (1982).

39. 62 Stat. 1155, ch. 758 (1948).

40. For a history of the development of early United States water pollution control, see E. MURPHY, WATER PURITY (1961).

41. Pub. L. 89-234, 79 Stat. 903. The legislation is explained in Hines, *Nor Any Drop to Drink: Public Regulation of Water Quality* (parts 1-3), 52 IOWA L. REV. 186, 432, 799 (1966, 1967).

built on attaining a certain water quality in streams and lakes, rather than targeting particular sources of pollutant discharges. The approach had two failings: 1) It required tracing the cause of water quality degradation backwards from a polluted waterway to particular sources, then assigning responsibility for pollution control to those sources; and 2) It assumed that pollution control should vary among sources of the same type depending on the capacity of the receiving waters to assimilate waste. Another impediment was the reluctance of states to discipline industries who provided them with valuable economic benefits. The severity of state efforts often varied with the economic or political importance of the polluter.

Against the backdrop of these unsuccessful experiments Congress enacted the 1972 Amendments to the Act, creating a comprehensive federal regulatory scheme for most identifiable water pollution sources.[42] The goal of the legislation was to eliminate totally the discharge of pollutants by 1985 and to "restore and maintain the chemical, physical and biological integrity of the nation's waters . . . ."[43] It set an interim goal of swimmable, fishable waters by 1983. Congress attempted to achieve most of the Act's purposes by enforcing two kinds of standards. Effluent standards limit concentrations of pollutants that may be discharged from particular kinds of sources. Water quality standards limit the concentration of pollutants in the stream.

The basic difference between the 1965 Act and the 1972 Act is that the later Act controls water pollution principally by effluent limitations. These numeric criteria are incorporated in permits to restrict the concentration of pollutants that can be discharged from specific sources regardless of how clean the receiving waters are. However, the receiving water quality standards that were the focus of the earlier Act were also retained in the 1972 amendments as a backup for the effluent limitations. These water quality standards are especially important where multiple sources, each complying with effluent limitations that prevent discharges exceeding a certain concentration of a pollutant, could still load such a large quantity of the pollutant into the waterway that it would become unfit for use.

In the Clean Water Act, Congress attempted to promote cooperation between the federal government and the states. Absolute effluent standards are nationally determined for classes and categories of sources so that, for instance, the maximum concentration of cadmium that can

42. Pub. L. 92-500, 86 Stat. 816 § 2, codified at 33 U.S.C. §§ 1251-1376 (1982).
43. 33 U.S.C. § 1251 (1982).

be discharged from a plating plant is the same regardless of where the plant is located. Water quality standards are set by the states, however, to protect uses of a particular stream. Existing cadmium levels on the stream may lead to even tougher control of cadmium discharges to prevent destroying an important fishery or drinking water supply. If the state fails to act to protect uses of the stream through adoption of water quality standards, the EPA can intervene.

Both effluent standards and water quality standards are implemented through a permitting system known as the National Pollutant Discharge Elimination System (NPDES).[44] The law simply declares all discharge of pollutants from any "point sources" without a permit to be unlawful. Thus, each and every discharger must have a permit. The job of issuing NPDES permits and enforcing their requirements can be and usually is delegated to the states. The permitting program of each state must meet federal criteria.[45]

A major "carrot" in the Act was the provision for grants to states and local governments for municipal sewage treatment plant construction.[46] Congress has since made over $50 billion in such grants to states and their local subdivisions.[47] The promise of federal largesse helped to ease state resistance to the extensive regulatory program in the Act.

B. Existing Federal Programs Protecting Groundwater

Since the 1970s, Congress has entered the arena of groundwater quality control by passing several statutes, the result of which is to protect groundwater from certain types of contamination or to clean up contaminated aquifers. None of these laws have the word "groundwater" in their titles; most are not ostensibly water pollution laws. By controlling activities (e.g., waste disposal, mining) or substances (e.g., pesticides), some federal laws incidentally help prevent groundwater quality problems. But they do not comprise a coherent groundwater protection program. Commentators have catalogued various combinations of federal laws which they say protect groundwater.[48]

44. 33 U.S.C. § 1341 (1982).

45. 33 U.S.C. § 1251(b) (1982).

46. 33 U.S.C. §§ 1281-86 (1982).

47. 19 Env't Rep. (BNA) 1828 (1989). The program is being phased out, however. In fiscal 1986, Congress began a nine-year conversion of the program. Authorization for direct grants ceases in fiscal 1990; from 1989 to 1994 funds are authorized for a program of state-administered loans. States must contribute an amount equal to 20% of the federal grant to a revolving fund; they may then lend funds from the pool to cities for construction of sewage plants. Repayments are to be used to fund additional loans. 33 U.S.C. § 1285 (1987).

48. Dycus, *supra* note 30, at 211-71; Getches, *supra* note 29, at 640-43; OFFICE OF GROUND-WATER PROTECTION, U.S. E.P.A., GROUND-WATER PROTECTION STRATEGY (1984); Henderson,

The law that most directly benefits groundwater quality is the Resources Conservation and Recovery Act (RCRA).[49] It regulates every aspect of hazardous waste generation—transportation, storage, processing and, finally, disposal of the materials, usually in the ground. Land disposal of many hazardous wastes eventually is to be phased out under the 1984 amendments.[50] The amendments also set up a program to prevent contamination from some two million underground storage tanks of which an estimated 100,000 are leaking. In addition, RCRA establishes guidelines for state regulation of other (nonhazardous) solid wastes. There are also provisions to encourage waste reduction and recycling. Although the activities regulated by RCRA threaten many resources, groundwater quality is the most obvious beneficiary since aquifer contamination is the most widespread casualty of waste disposal.

A special type of waste disposal, deep well injection, is regulated under the Safe Drinking Water Act.[51] The Act also protects areas around wells and wellfields used for drinking water. Congress requires states to designate wellhead areas and to establish programs to protect these areas from contaminants. The program is relatively new but appears to have considerable potential for protecting public water supply wells if it is adequately funded. The same Act allows EPA to designate "sole source aquifers" that provide the principal drinking water supplies for an area. Restrictions are then placed on any federal project that could contaminate the aquifer.

Coal mining activities and reclamation of mined areas are controlled under the Surface Mining Control and Reclamation Act.[52] Strict control of regulated mines prevents most groundwater pollution from this activity. The Act, however, applies only to coal mines started since it was passed in 1977.

One federal statute that on its face appears to have considerable po-

supra note 30, at 43-44, 60-63; U.S. GEOLOGICAL SURVEY, *supra* note 27, at 118-458; Gilbert, *supra* note 24, at 2-1, 2-7 ENVIRONMENTAL PROTECTION AGENCY, EPA ACTIVITIES RELATED TO SOURCES OF GROUND-WATER CONTAMINATION (1987); NATIONAL WATER ALLIANCE, *supra* note 33, at ix; Note, *supra* note 29, at 784; Tripp & Jaffe, *Preventing Groundwater Pollution: Towards a Coordinated Strategy to Protect Critical Recharge Zones*, 3 HARV. ENVTL. L. REV. 1 (1979); Coggins & Glicksman, *supra* note 35, at 241; Yanggen & Amrhein, *Groundwater Quality Regulation: Existing Governmental Authority and Recommended Roles*, 14 COLUM. J. ENVTL. L. 1 (1989); L. CANTER & R. KNOX, GROUND WATER POLLUTION CONTROL (1985); U.S. OFFICE OF TECHNOLOGY ASSESSMENT, PROTECTING THE NATION'S GROUNDWATER FROM CONTAMINATION 63 (1984); Murphy, *Some Legal Solutions for Contemporary Problems Concerning Groundwater and Aquifers*, 4 J. MIN. L. & POL'Y 49, 86 (1988).

49. 42 U.S.C. §§ 6901-6991i (1982).

50. Pub. L. 98-616, 98 Stat. 3276, codified at 42 U.S.C. § 6901.

51. 42 U.S.C. § 300h (1982).

52. 30 U.S.C. §§ 1201-1328 (1982).

tential for protecting groundwater from polluting activities is the Clean Water Act.[53] The Act forbids the "discharge" of pollutants into the waters of the United States. However, after getting some mixed judicial reactions to its early attempts to enforce the Act against dischargers into groundwater,[54] EPA retreated and made no further efforts to demand NPDES permits in these circumstances. One reason the agency may not have pressed the matter is that it was already proceeding to implement the recently enacted Underground Injection Control program under the Safe Drinking Water Act, which covers most (though not all) of the activity that could have been regulated under the Clean Water Act NPDES program.

To the extent that "discharges" of pollutants from point sources contaminate aquifers, the Clean Water Act is a potential weapon, though it may take congressional action or citizen litigation to prod the agency to use its authority. The logic that moved Congress to impose nationally uniform effluent limitations on discharges of pollutants applies whether the discharge is into groundwater or surface water. Dischargers should be subject to the same minimum requirements regardless of what state they operate in or what body of water receives their waste.

In addition to the unused reach of the NPDES permitting program, EPA clearly has authority under the Clean Water Act to issue groundwater quality criteria and publish information on aquifer restoration and maintenance,[55] and it can require states to promulgate groundwater quality effluent standards.[56] It has not exercised this authority.

The nonpoint source control provisions of the Clean Water Act

53. 33 U.S.C. §§ 1251-1387 (1982).

54. *See* United States v. GAF Corp., 389 F. Supp. 1379 (S.D. Tex. 1975), which held that where surface waters are not affected, groundwater cannot be regulated under the Act. Without appealing, the EPA decided to limit the permit requirement to groundwater discharges associated with surface water pollution. The Seventh Circuit reached the opposite conclusion, holding that the EPA's permit requirements for deep well disposal were part of an overall effort to limit surface discharges. Moreover, the Court concluded that it was Congress' intent, as evidenced in the language of the Clean Water Act, to provide federal controls of water disposal into wells. U.S. Steel Corp. v. Train, 556 F.2d 822 (7th Cir. 1977). Weeks later the Fifth Circuit held that EPA could not require an NPDES permit for deep well injection because it was not into navigable waters. Exxon Corp. v. Train, 554 F.2d 1310 (5th Cir. 1977). "Navigable waters" are defined in the Act as "waters of the United States." 33 U.S.C. § 1367 (1982). *Cf.* Quivira Mining Co. v. United States EPA, 765 F.2d 126 (10th Cir. 1985), cert. denied, 474 U.S. 1055 (1986) (mine pond likely to overflow into arroyos that were part of an aquifer and that flowed on the surface only in heavy rains was subject to NPDES permit; flows ultimately went into navigable waters). Furthermore, the language and history of the Act appear to support application of the Act to groundwater. Nevertheless, EPA has not seen fit to pursue the matter. For a discussion critical of EPA's approach, see Dycus, *supra* note 30, at 239-44.

55. 33 U.S.C. § 1314(a)(1), (2) (1982).

56. Kentucky *ex rel.* Hancock v. Train, 9 ERC 1280, 1282 (E.D. Ky. 1976).

which were broadened in the 1987 amendments[57] are among the most important parts of the Clean Water Act for protecting groundwater. These sources are by definition outside the Act's regulation of point sources subject to the NPDES program. Nonpoint sources often cause the greatest problems for groundwater quality. Examples of nonpoint sources are septic tanks, mines, agricultural operations and urban runoff. If these sources are effectively controlled, groundwater is protected from contamination. Under the Clean Water Act every state is required to submit an assessment report and a management plan for nonpoint source pollution to EPA. There is, however, no enforceable requirement that the plan be effective or that it actually be implemented.

Two federal laws control the manufacture and use of substances that can contaminate groundwater. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)[58] requires federal registration of pesticides after appropriate testing. The EPA can limit the distribution, sale or use of pesticides "to the extent necessary to prevent unreasonable adverse effects on the environment."[59] Thus, if a pesticide is detected in an aquifer, specific pesticides could be selectively banned in the recharge area. The Toxic Substances Control Act[60] regulates manufacturers of chemicals that EPA finds may present a risk of injury to health or the environment. The agency reviews required test data on the chemicals and may curb their manufacture, processing or distribution. The Act has unused potential for identifying and controlling chemicals that threaten to pollute groundwater.

Clean-up statutes include the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)[61] and provisions of RCRA.[62] CERCLA, also known as Superfund, established a program for cleaning up hazardous substances in inactive or abandoned disposal sites. An $8.5 billion fund has been set up by Congress to help pay the costs of cleaning up these sites.

The Safe Drinking Water Act, mentioned above in connection with its Underground Injection Control Program and Wellhead Protection Program, also sets drinking water standards.[63] By prescribing permissible limits for concentrations of certain chemicals in drinking water, the Act restricts the use of certain groundwater sources. These standards are

57. 33 U.S.C. § 1329 (1987).
58. 7 U.S.C. §§ 136-136y (1982).
59. 7 U.S.C. § 136a. *See also*, 7 U.S.C. § 136d on suspension and cancellation of registration.
60. 15 U.S.C. §§ 2601-2671 (1982).
61. 42 U.S.C. §§ 9605-9675 (1982).
62. 42 U.S.C. §§ 6901-6991i (1982).
63. 42 U.S.C. §§ 300f-300j (1982).

increasingly being used in other contexts (such as in aquifer programs) as benchmarks to determine whether certain aquifers yield potable water.

C. *Recent State Progress in Groundwater Protection*

To the extent states fill the need for protecting groundwater, Congress need not legislate. Several state legislatures have been active in devising frameworks to achieve groundwater protection. Additional program development is possible under the aegis of existing federal pollution control statutes which provide a measure of groundwater protection and limited funding for state planning and programs.[64] States also have utilized their own water-quality laws, specific groundwater protection legislation and water allocation laws to pursue policy objectives ranging from nondegradation and limited degradation of groundwater quality, to differential protection.[65] State regulation of groundwater quality, like federal regulatory programs, often suffers from dispersal of administrative responsibility among several agencies and from poorly defined agency objectives. The greatest assets of the states are their proximity to the popular needs that should shape a protection policy and their existing presence in land use and water allocation affairs where controls are most effectively imposed.

States are well situated to tailor regulatory approaches to the specific needs of particular aquifers.[66] Aquifer protection may require decisions on the necessary level of protection, land use controls, facility design requirements, well construction and use restrictions and limits on amount and rate of extraction.[67]

The diversity of state groundwater quality needs and objectives, especially in the manner that aquifers are to be protected, argues for individualized state regulatory programs rather than federal legislation to address most problems of aquifer protection. State programs show promise, though they are only beginning to cope with the serious problems that exist.

States are beginning to pass laws to control kinds of groundwater

64. Such federal statutes include the Clean Water Act, RCRA, CERCLA, and the Surface Mining Control and Reclamation Act. *See* Henderson, *The Institutional Framework for Protecting Groundwater in the United States*, in PLANNING FOR GROUNDWATER PROTECTION 43-44 (G. Page ed. 1987).

65. *Id.* at 39. *See also* Note, *A DRASTIC Approach to Controlling Groundwater Pollution*, 98 YALE L.J. 773, 784 (1989).

66. *See, e.g.*, THE CONSERVATION FOUNDATION, GROUNDWATER PROTECTION 180, Fig. 47 (1987) (surveying the groundwater quality standards of 19 states); OFFICE OF GROUNDWATER PROTECTION, U.S. E.P.A., OVERVIEW OF STATE GROUNDWATER PROGRAM SUMMARIES, vol. 1 A-13 (1985).

67. *See* Henderson, *supra* note 30, at 40.

pollution that are particularly troublesome to them. For example, several states have enacted laws to control "chemigation"—the practice of injecting agricultural chemicals into sprinkler systems which can be drawn down the well if proper equipment is not used.[68] Most western states have also enacted their own pesticide laws designed in part to protect groundwater.[69] In addition, a number of states have laws regulating underground storage tank leakage. Recently enacted state groundwater laws illustrate a variety of regulatory approaches.

Arizona has adopted a differential protection groundwater code.[70] The Arizona focus is based upon broad protection of drinking water uses primarily, with secondary attention to other uses.[71] The statute borrows provisions from the Safe Water Drinking Act and RCRA and employs a permitting system to restrict discharges to groundwater.[72] The statute requires applicator licensing and permits for particular uses of pesticides. It includes stiff criminal and civil penalties for violations.[73]

Wisconsin, a state heavily dependent on groundwater, has enacted nondegradation standards which apply uniformly to all aquifers within the state.[74] The Wisconsin program features a two-tiered system of numeric "enforcement standards" and "preventive action limits," set at a percentage of the enforcement standards, which trigger state action. "Enforcement standards" are maximum concentrations of substances that will be allowed in groundwater.[75] "Preventative action limits" are set at a percentage of the enforcement standard.[76] The Wisconsin program also includes several features designed to draw localities into state-local partnerships for groundwater protection.

Florida is even more dependent on groundwater than is Wisconsin,

68. CAL. FOOD & AGRIC. CODE § 13145 (1986); COLO. REV. STAT. § 35-11-106 (1989); IDAHO CODE § 22-1402-03; N.D. CENT. CODE § 4-35.1-03 (1987); S.D. CODIFIED LAWS ANN. § 34A-2A (Supp. 1989).

69. ALASKA STAT. § 46.03.730 (1987); ARIZ. REV. STAT. ANN. § 3-363 (1986); COLO. REV. STAT. § 35-10-104 (1983); HAWAII REV. STAT. § 149A-19 (Supp. 1987); IDAHO CODE § 22-3420 (1976); KAN. STAT. ANN. § 2-2203 (1982); MONT. CODE ANN. § 80-8-103 (1989); NEVADA REV. STAT. § 555.380 (1986); N.M. STAT. ANN. § 76-4-3(R) (Supp. 1985); N.D. CENT. CODE 4-35-06 (Supp. 1989); OKLA. STAT. ANN. tit. 2 § 3-62 (Supp. 1990); OR. REV. STAT. § 634.016 (Supp. 1987); S.D. CODIFIED LAWS ANN. § 38-21-23 (Supp. 1989); TEX. AGRIC. CODE ANN. § 76.003 (Vernon Supp. 1990); UTAH CODE ANN. § 4-14-6 (1988); WASH. REV. CODE § 15.58.040 (Supp. 1989); WYO. STAT. § 35-7-355 (1988).

70. The Arizona Groundwater Protection statute is codified at ARIZ. REV. STAT. ANN. § 45-402 (1980).

71. Gilbert, *supra* note 24, 2-39.

72. ARIZ. REV. STAT. ANN. § 45-402 (1980).

73. *Id.* § 45-405.

74. *See* Yanggen & Amrhein, *supra* note 48, at 9; WIS. STAT. §§ 160-001 through 160.50 (1984).

75. *See* Yanggen & Amrhein, *supra* note 48, at 9; WIS. STAT. § 160.01 (1989).

76. *Id.*

drawing over 92 percent of its drinking water from wells.[77] The Florida program's principal features are: a groundwater classification system; ground water quality standards; required monitoring plans for all discharge permits; and zones of discharge.[78] Freshwater aquifers are classified as G-I or G-II, depending on the quantity of total dissolved solids. A zone of discharge is allowed for existing dischargers to their property line, and a limit of 100 feet is established for new dischargers. And, monitoring plans are required for discharge permits for landfills, sewage treatment plants or industrial discharges.[79] Florida has set nondegradation standards for its freshwater aquifers, but less rigorous standards for saltwater aquifers.

With sufficient funds and technical information, it is likely that states will move more deliberately ahead with the development of aggressive and innovative aquifer protection programs. Importantly, these programs can be custom-made to fit the situation of the individual states and therefore operate more effectively to protect groundwater quality. State regulatory systems can and must vary according to particular conditions, state objectives and available control techniques. Superb studies have been prepared for both Kansas and Wisconsin recommending state programs shaped by the special groundwater problems of those two states.[80] The authors call for using existing state institutions and laws to solve those problems.

Groundwater quality can be affected by the ways in which it is allocated, developed and used. It is important to states that groundwater quality control not clash with systems for allocating rights to use quantities of groundwater. Therefore, quality control and quantity allocation should be coordinated. Furthermore, water allocation is a sphere of regulatory activity that has long been left to the states for political and practical reasons. However, in the absence of effective state efforts federal action may be taken.

Some state laws recognize that control of the amounts, rates, places and manners in which groundwater is extracted is an effective way to protect groundwater from certain kinds of degradation.[81] Nearly all states initiated early laws to control well drilling that required, among

77. Rhodes, *Development of Florida's Ground Water Quality Program*, in PROCEEDINGS OF NATIONAL SYMPOSIUM ON INSTITUTIONAL CAPACITY FOR GROUND WATER POLLUTION CONTROL 60 (D. Fairchild ed. 1985).

78. *Id.* at 62.

79. *Id.* at 61, 62.

80. Coggins & Glicksman, *supra* note 35; Yanggen & Amrhein, *supra* note 48.

81. PLANNING FOR GROUNDWATER PROTECTION 370-72 (G. Page ed. 1987); CONSERVATION FOUNDATION, *supra* note 35, at 199-202.

other things, use of casings and other measures to prevent infiltration of water from lower quality to higher quality aquifers.[82] Excessive pumping and well placement also can cause contamination problems. Several states' groundwater pumping permit laws now include criteria to protect groundwater quality as part of regulating well location, quantities and rates of pumping.[83] A few states allow the creation of special groundwater "critical management areas" based on water quality degradation problems as well as groundwater mining (or overpumping) problems.[84]

Protection may implicate state surface water allocation laws. This is because surface and groundwater pollution problems are often intimately related. Alluvial aquifers are part of surface stream systems and pollution of one is pollution of the other. Adequate groundwater protection thus requires states to consider water quality criteria in allocating surface waters.

D. Proposals for Federal Legislation

Recent sessions of Congress have considered various bills to deal with the "groundwater problem." Several commentators have also offered their prescriptions for federal legislation. They can be grouped into three categories according to the level of federal activity contemplated: research; limited or comprehensive regulation; concern with specific problems.

1. Research

The proposals that have come the closest to enactment are those

82. *E.g.*, ARIZ. REV. STAT. § 45-602 (1987); IDAHO CODE § 42-238 (1977); OR. REV. STAT. § 537.605 (1987).

83. *E.g.*, ARIZ. REV. STAT. ANN. § 49-243 (1987) (the applicant for an individual permit may be required to furnish information showing that no pollutants will further degrade the quality of the aquifer that already violates the aquifer quality standards for that pollutant.); COLO. REV. STAT. § 37-90-107(5) (1977) (in determining whether a proposed use will impair uses, "impairment" includes "the unreasonable deterioration of water quality"); IDAHO CODE § 42-235 (Supp. 1989) ("owner shall obtain a permit . . . to protect public health, safety and welfare and the environment and to prevent the waste or mixture of any water from a well"); KAN. STAT. ANN. §§ 82a-711(a), (c) (Supp. 1987) (defines impairment to include the "unreasonable deterioration of the water quality at the water user's point of diversion"); MONT. CODE ANN. §§ 85-2-311, -508 (1989) ("shall issue permit if the applicant proves . . . (2)(a)(iii) the effects on the quantity and quality of water."); NEB. REV. STAT. (1988) ("contamination" shall mean "material which enters the groundwater . . . and causes degradation of the quality of groundwater sufficient to make ground water unsuitable for present or reasonably foreseeable beneficial uses"); OR. REV. STAT. § 537-515 (1987) ("pollution" of groundwater means "any impairment of the natural quality of such groundwater"); WYO. STAT. ANN. § 41-3-901(a)(vii) (1977) ("pollution" of underground water means "any impairment of the natural quality of such water").

84. *E.g.*, KAN. STAT. ANN. § 82a-1036(d) (1984); COLO. REV. STAT. § 37-90-101 (1973); ALASKA STAT. § 46-15-255 (1987); NEB. REV. STAT. § 46-674 (1988); OR. REV. STAT. ANN. §§ 537.730(1)(f), 537.735(1) (1988). *See* Tripp & Jaffe, *supra* note 48.

that commit the national government to undertake and finance a program of groundwater research. Proponents of federal action universally urge at least additional research. Even those who are conservative about whether the federal government has a place in groundwater quality control usually favor a federal role in research. Though this is the area of greatest agreement in Congress, even simple research packages have failed to clear both houses.

There is considerable merit in a strong federal commitment to a groundwater research program because federal, state and local agencies must have access to technical information about the dynamics of groundwater hydrology, methods to prevent contamination and how to develop and interpret data. Using federal resources to develop research and distribute the results can relieve states of considerable burdens and increase their success in controlling groundwater quality and in carrying out aquifer protection strategies as urged in this paper. A well-conceived program with coordination across agency lines can minimize wasteful duplication among federal agencies and among the states.

The research bill that came the closest to becoming law was H.R. 791 in the 100th Congress.[85] It would have authorized $50 million in new funding for groundwater research and bolstered research efforts in three federal agencies. EPA would be directed to conduct health risk assessments for all significant groundwater contaminants and to develop technology to prevent, detect and remedy contamination. The U.S. Geological Survey (USGS) within the Department of the Interior would establish a National Groundwater Assessment Program, essentially making permanent activities that have been carried on in that agency on a year-to-year basis for some time. The Department of Agriculture would study how farming methods affect water quality and the quantity of water used and would set up a task force especially to deal with management practices concerning use of nitrogen fertilizers. The activities of federal agencies would be coordinated by an Interagency Committee on Ground Water Research. Under the bill EPA and USGS would provide technical assistance to state and local governments and a National Groundwater Information Clearinghouse would be formed by the Secretary of the Interior. H.R. 791 overwhelmingly passed the House. Although very similar legislation[86] passed the Senate, a conference committee was unable to resolve the differences between the two.

85. H.R. 791, 100th Cong., 1st Sess. (1987). A very similar research bill passed the House the year before: S. 513, 100th Cong., 1st Sess. (1987) (the companion bill to H.R. 791, introduced by Senator Durenberger).

86. S. 1105, 100th Cong., 1st Sess. (1987) (proposed by Senator Burdick).

The differences between the House and Senate versions had to do primarily with: 1) whether the states or the federal government would have the lead role in groundwater protection; and 2) whether the EPA alone or jointly with the Department of the Interior would chair the Interagency Committee. The House favored a declaration that, beyond research, the states should have primary regulatory authority. The bill did not include any regulatory programs, but some Senators believed that the federal government should eventually take the lead in groundwater regulation and there should be no recitation indicating deference to the states. This essentially academic question created a philosophical schism that could not be bridged. The Senate also believed that the committee to be set up under the legislation should be chaired by the EPA Administrator alone rather than being jointly chaired by the Administrator and the Secretary of the Interior. These differences seem rather insubstantial but they indicate the depth of sentiment in the two houses over basically institutional issues. These questions—especially the disagreement over federal versus state authority—could impede progress on future legislation. Some observers felt that the bill did not pass because Congress simply ran out of time to resolve their differences.[87] But if the two rather superfluous issues had not been injected into the debate, Congress might have enacted the otherwise noncontroversial research bill. The problems that arose with that bill are precursors of the difficulties that future groundwater bills are likely to encounter.

Bills reflecting the deliberations of Congress on H.R. 791 were introduced in the 101st Congress in 1989.[88] The same general structure is reflected in both H.R. 37 and S. 203.[89] The EPA Administrator would be assigned primary responsibility over research coordination. The interagency committee would be chaired jointly by the Administrator and the Secretary of the Interior in H.R. 37, but by the Administrator alone in S. 203. Appropriations authorized in the House bill would more than triple those in H.R. 791. The Senate bill, like the Senate version of H.R.791, expands somewhat on the EPA research agenda and has a provision for grants to states to support development of prevention, detection and remedial strategies. The Department of Agriculture is given responsibility for research in efficient chemical use, reduced water use in irrigation, integrated pest management and chemical management. The Bureau of Reclamation is to study the effects of its projects on water quality and quantity. The House bill gives the Department of the Interior the re-

87. *See* Current Developments, 19 Env't Rep. (BNA) at 1443 (Nov. 11, 1988).
88. *See* H.R. 3676, 101st Cong., 1st Sess. (1989).
89. *See* H.R. 37, 101st Cong., 1st Sess. (1989); S. 203, 101st Cong., 1st Sess. (1989).

sponsibility of initiating a groundwater assessment program to determine the location, hydrogeological properties, quality, quantity and rates of depletion in groundwater resources of the United States. Unlike S. 203, which emphasizes EPA's research role, H.R. 37 expands EPA's role to include a technology assistance program to find effective controls for sources of contamination.

Later in 1989, Representative James Scheuer (New York) introduced a bill for a National Ground Water Research Act (H.R. 2734) in the House.[90] He proposed a co-chaired Interagency Committee which included an assessment of groundwater resources and development of profiles for contaminants as well as a research program. While the bill acknowledges federal responsibilities for groundwater protection under existing programs, it recites that state and local governments have primary responsibility for groundwater protection, maintenance and improvement. The bill adds that it would not abrogate state rights to allocate water though there is nothing in the substantive sections of the Act that could conceivably have that effect. A strong feature of the bill creates a federal grant program to encourage state strategies to protect groundwater quality. It specifically names programs including planning, aquifer mapping, monitoring, data management, public education and other activities vital to the success of groundwater quality protection. Grants would be for 50 percent of program costs. The bill would authorize $25 million a year for three years for state grants.

2. Regulation

As might be expected, congressional sentiment ranges from the view that the federal government ought to keep its hands off groundwater regulation in deference to the states to the belief that comprehensive federal regulation is needed. There have also been a number of bills introduced to amend specific federal environmental statutes to improve their control of groundwater quality.

a. Comprehensive federal regulation

At one extreme, a bill introduced in the 100th Congress by Senator Dave Durenberger and others[91] would adopt a sweeping regulatory program reminiscent of the Clean Water Act but specific to groundwater. In the spirit of the CWA it declares a nondegradation policy for groundwater, a significant departure from the administratively generated EPA

90. *See* H.R. 2734, 101st Cong., 1st Sess. (1989).
91. S. 2091, 100th Cong., 2d Sess. (1988).

Ground Water Protection Strategy of 1984 which favors classifying aquifers for particular uses and levels of degradation. The bill would establish a system of discharge permitting that can be delegated to states which meet federal requirements. A special set of new source performance standards mirrors similar programs under the Clean Air and Water Acts.

Permitting under S. 2091 would attempt to accomplish certain primary (health-based) and secondary (welfare-based) groundwater protection standards developed by EPA for various contaminants. Special protections, which would be reflected in permitting requirements, would apply to wellhead protection areas — the areas above public drinking water sources, and primary aquifer protection areas — highly valuable or vulnerable aquifers. A provision in the bill would impose corrective action on contamination sources whenever a contaminant level exceeds 50 percent of the primary standards and remedial action whenever contaminants substantially exceed those standards.

S. 2091 included provisions to make sources of contamination strictly liable for everything from inadequate monitoring to the damages caused to natural resources. In this respect it seemed to overlap CERCLA. Criminal and civil penalties in the bill were similar to those in other environmental laws, but were tougher than any existing federal environmental law in its proposed imposition of liability for individual personal injuries and economic losses. The bill included major federal research in groundwater and technical assistance to the states.

Notwithstanding its apparent comprehensiveness, S. 2091 would not have been universally effective as groundwater quality protection legislation. Furthermore, it left many important jobs undone. The strong emphasis on "discharges" created the impression that it would address the most significant need in groundwater protection. Greater control of identifiable pollutant discharges would help in locations where industrial sources are primarily to blame for groundwater pollution. But the most widespread groundwater contamination problems are attributable to sources like waste dumps, spills, storage activities, agricultural chemical use, mining, urban runoff and underground tanks. These are not like the "discharges" into rivers and streams that are so effectively controlled under the Clean Water Act's point source program. Therefore, an elaborate program to regulate "dischargers" simply would not solve the nation's most troubling groundwater problems. Moreover, to the extent that such a program is needed, it can be provided by minor extensions of the Clean Water Act itself.

The numerous and diverse nonpoint sources that contribute to groundwater contamination were virtually ignored in S. 2091 in favor of controlling identifiable dischargers. The preventive measures most needed in particular areas of the country vary. They may include limits on groundwater extraction where withdrawals lead to infiltration or migration of pollutants, land management practices, cleanup of disposal sites, or interception of natural sources like salt seeps.

Although S. 2091 did not touch the widespread western problem of agricultural sources that do not constitute "discharges," there is a provision for encouraging and compensating farmers to retire land directly over "sole source aquifers." This would lessen the threat to important wells posed by application of agricultural chemicals on the overlying lands. Such measures are important attempts to go beyond controlling discharges and should be addressed as part of more pervasive state and local land use and management programs.

The bill's focus on discharges and its liability provisions may reflect the fact that they are the easiest sources of contamination to control. But it simply is not possible to trace the causes of groundwater contamination to specific sources in many, perhaps most, situations. This is not to denigrate the importance of regulating discharges or the role of the federal government in controlling this aspect of groundwater quality regulation. But such sources could be controlled adequately by expanded use of the Clean Water Act and other existing statutes and without establishing a major new federal regulatory program.[92]

b. Limited regulation

An approach illustrating deference to the prerogatives and particular needs of the states is found in S. 20, introduced in the 100th Congress.[93] Under the bill EPA would set groundwater quality criteria based on scientific data. It would then be up to the states to set groundwater protection standards at least as strict as the primary drinking water regulations fixed by EPA under the Safe Drinking Water Act. These standards would be subject to federal approval but EPA could not substitute its own standards. Federal programs for cleanup or regulation of groundwater contamination would attempt to achieve the state-prescribed standards. States would be required to assess their groundwater resources and devise programs for groundwater quality protection con-

92. *See supra* notes 33-36 and accompanying text. Pub. L. 92-500, 86 Stat. 816, codified at 33 U.S.C. §§ 1251-1376 (1982); 33 U.S.C. § 1251(b) (1982); 33 U.S.C. §§ 1281-1286 (1982); 19 Env't Rep. (BNA) 1828 (1989).

93. S. 20, 100th Cong., 1st Sess. (1988).

sistent with their own standards. EPA would assist the states in designing and structuring their own programs. States would be eligible for grants for planning, assessing groundwater resources and groundwater program management. The bill has considerable merit in addressing the need for state-developed aquifer protection.

One recent bill concentrates on western groundwater protection. H.R. 2521 would require states with Bureau of Reclamation projects to promulgate groundwater protection plans subject to federal criteria.[94] Failure to do so within three years would lead to termination of funds for reclamation projects. There is a link between many reclamation activities and programs and groundwater contamination. Expanded irrigation activity, often to lands with naturally contaminated soils, has caused loading of salts and other contaminants to the nation's waters, including aquifers. But programs specifically dealing with such problems may be more appropriate.

The federal requirement of state groundwater protection plans is a potentially important component of a national strategy. However, the bill would not extend the provision to non-reclamation states. Further, it employs as its only sanction for failure to promulgate a state plan, penalties to the beneficiaries of reclamation projects. It seems to be a bill primarily motivated and designed as a device to discipline states receiving federal water project funding and secondarily a groundwater protection program. Consequently it ignores the serious problems of non-western states. It also minimizes incentives for western states that currently receive little or no assistance from the reclamation program. The need for groundwater programs is not necessarily in proportion to a state's stake in the reclamation program.

A minimalist approach to federal groundwater control legislation was shown by S. 1992 in the 100th Congress.[95] The bill would simply direct federal agencies to cooperate in the development of federal groundwater policy. Like most of the research bills, it would set up an interagency committee but the purposes would be primarily to streamline government agency activity and identify major state technical assistance requirements. The bill appears to be a "first step" toward a more rational and appropriate federal role.[96]

S. 1992 was one of the first proposals for federal groundwater legis-

94. H.R. 2521, 101st Cong., 1st Sess. (1989) (similar to H.R. 2320 introduced in the previous Congress).

95. S. 1992, 100th Cong., 1st Sess. (1987).

96. S. 362, 101st Cong., 1st Sess. (1989). A very similar bill, S. 362, has been introduced in the 101st Congress.

lation. It is enlightening to consider the early reactions from federal agencies to that modest proposal. In the Reagan Administration both EPA and USGS opposed S. 1992, apparently taking offense at the bill's inherent suggestion of interagency duplication and lack of coordination. The agencies contended that there was no need for an interagency committee and that lead agencies (EPA and USGS jointly) were unnecessary.[97] The reiteration of the committee concept in nearly every subsequent bill, even research bills, since then shows a congressional determination that disagrees with the initial agency response. In later bills the agencies quelled their opposition to the committee concept.

The agencies also asserted that S. 1992 would duplicate their own efforts at coordination.[98] EPA's principal initiative, the Ground Water Protection Strategy,[99] has had some success but few observers believe that it is adequate. EPA's colleague in opposing mandatory coordination was USGS, an agency of the Department of the Interior. It is interesting that Interior vigorously spoke out against the EPA Strategy when it was proposed.[100]

Unlike the federal agencies, several other interests supported S. 1992. Industry representatives saw it as a cure for "disjointed" federal groundwater activities that would avoid the specter of a comprehensive federal regulatory bill.[101] Environmentalists applauded the interagency committee idea and supported the bill as a step toward a more comprehensive program.[102]

c. Special problem bills

Several bills have attempted to deal with particular problems. H.R. 2258 would attack the serious problem of nitrogen contamination by agricultural chemicals.[103]

Another pending bill (H.R. 599) would extend controls over pesticides by amending several environmental laws. It would amend FIFRA[104] to require registered distributors and vendors to develop management practices to help curtail leaching of pesticides into groundwater. It also would amend the Safe Drinking Water Act[105] to set maximum

97. 19 Env't Rep. (BNA) 70 (1988).
98. *Id.*
99. *Id.*
100. *See* H.R. REP. No. 1136, 98th Cong., 2d Sess. 13 (1984).
101. 19 Env't Rep. (BNA) 71 (1988).
102. *Id.*
103. H.R. 2258, 100th Cong., 2d Sess. (1988).
104. 7 U.S.C. § 136 (1982).
105. 42 U.S.C. § 300f (1982).

levels for pesticides in drinking water based on research. The Clean Water Act[106] would be amended to improve nonpoint source control of pesticides. States would be required to submit programs to prevent pesticide pollution of surface and groundwater for the approval of the EPA Administrator.

Short-lived measures to strengthen regulation of polychlorinated biphenyls were also considered in Senate and House committees.[107] Control would be shifted from the Toxic Substances Control Act to RCRA.

III. A Recommended State-Federal Approach

Much of the discussion of federal groundwater legislation has been over whether there is to be "comprehensive" federal regulation. Debates over the degree of desirable federal legislation tend to be polarized around a largely symbolic federalism issue. Arguments array against intrusions on states rights or against the failure to protect nationally important resources.

The overall national groundwater protection program should be comprehensive, but that program should call on federal and state governments each to do what they can do best. For instance, it should employ a strong federal hand in certain matters such as where the regulation will determine how nationally distributed products that pose a contamination threat to groundwater are to be produced, packaged, handled and used. But Congress need not construct and operate every aspect of a federal groundwater quality protection program. Managing particular aquifers implicates land use and water allocation regulation and these matters are best handled at the state and local levels.

Regulatory tasks that are best performed by the United States include control of pesticides or toxic substances. Substances that are nationally produced and distributed can only be controlled effectively on a national scale. Thus, it is appropriate to subject their manufacture, sale and application to federal regulation. In addition, such laws should be nationally uniform in order to be fair to those who are regulated. Existing federal programs address most of the subject matter that calls for federal action but they need to be strengthened. The potpourri of federal programs are not now aimed at achieving a specific goal for groundwater and they sometimes duplicate or conflict with one another. Amendments should leave no doubt about the purpose or means of protecting groundwater resources.

106. 33 U.S.C. § 1329 (1987).
107. S. 2693, 100th Cong., 2d Sess. (1988).

A clear announcement of a coherent federal policy for groundwater could guide the course of these programs. It should incorporate groundwater objectives into existing programs (like the Clean Water Act's point source permitting program) that have unused potential in this area.

As discussed earlier, states have begun to move into groundwater quality protection with their own programs designed to meet their localized needs consistent with their legal systems of water allocation. These efforts can and should be enhanced by greater use of state water planning and land use authority. Although some state programs show promise, they are hampered by a lack of sufficient resources which in turn limits technical information. Where resources or political will are lacking, federal incentives are needed.

A federal program should provide assistance and incentives for states to develop their own aquifer protection strategies. But states should have greater latitude to select the outlines of these strategies than they have in assuming primacy under the Clean Water Act and other environmental laws. The states should be able to decide for each aquifer or type of aquifer what activities should be regulated to protect it, how to regulate them and the level of protection to be achieved. Each state can develop strategies that best fit each situation within the context of its laws and institutions. A state with serious problems of agricultural contamination of groundwater and a strong tradition of free choice by water users may adopt control methods far different from another state with similar problems but with a heavily regulated water rights system. A non-agricultural state may not need to be concerned with such issues but may have to impose strict controls on the location of chemical manufacturing facilities in order to protect groundwater for municipal uses. This may call for local zoning or state laws to keep such plants away from sensitive areas where groundwater might be at risk.

A particularly attractive approach for states may be the establishment of special management areas where intensive programs can address specific groundwater problems. Targeting problems in need of special immediate attention may be more important than having a program that controls every source of contaminants or a plan for every aquifer.

Some states may choose to impose a system of charges for every unit of waste produced by manufacturers. The revenues could be used to pay for monitoring and controlling the waste stream.

Both expanded federal programs and state-tailored aquifer protection strategies require strong federal financial support. The power of the federal purse is necessary to deal with groundwater contamination be-

cause the expense of controlling groundwater quality is enormous. Expensive technology is needed to detect the nature and extent of problems and to prevent and clean up contamination.

A national groundwater policy thus should manifest a commitment to protecting groundwater resources using an optimal combination of federal and state tools. The debate is properly over what that should mean in practice rather than presupposing that the federal government can do it all or that, left to their own devices, the states can and will protect groundwater quality satisfactorily. The following components should be included in a national groundwater protection package.[108]

A. Policy Goals

Congress has never expressed a national policy of groundwater protection, leaving agencies uncertain about how to interpret and apply federal laws that affect groundwater quality. Federal groundwater legislation should contain an "explicit, comprehensive national legislative mandate to protect groundwater from contamination"[109] by optimal federal and state means. The policy should effectively amend all existing laws that affect groundwater, unambiguously directing federal officials to make groundwater protection part of their mission in carrying out statutes and exercising their authority.

The policy statement should emphasize that both state and federal roles are needed to protect groundwater effectively. Thus, Congress should commit itself to relying on states to protect aquifers within their borders. States would be charged with deciding the degree of degrada-

108. Two recent reports make proposals similar to the one suggested in this article. They both stress the importance of tandem state and federal action to protect groundwater quality. In 1987, the Conservation Foundation published a book that included recommendations of the National Groundwater Policy Forum, as a joint effort of the National Governors' Association and the Foundation. CONSERVATION FOUNDATION, *supra* note 35. The Forum's recommended approach included a requirement that states adopt a comprehensive groundwater management program satisfying certain requirements.

A report by the Environmental and Energy Study Group synthesized views expressed in symposia of congressional representatives and staff and conferences of people knowledgeable in groundwater matters. ENVIRONMENTAL AND ENERGY STUDY INSTITUTE, SPECIAL REPORT, A CONGRESSIONAL AGENDA TO PREVENT GROUNDWATER CONTAMINATION (1986). It was prepared by Judy Campbell Bird, who authored another report by the Institute that contains a succinct summary of ideas and options for groundwater policy programs. ENVIRONMENTAL AND ENERGY STUDY INSTITUTE, GROUNDWATER PROTECTION: EMERGING ISSUES AND POLICY CHALLENGES (1985). The Special Report included an agenda that recommended limited federal legislation designed to expand federal, state and local groundwater protection efforts. It favors a nationally set groundwater contamination prevention goal, coordination of existing federal programs and primary reliance on state action supported by federal assistance. In addition, it emphasizes public education and participation in decisionmaking and the involvement of private interests. The Institute's proposal also includes a special program to protect groundwater from agricultural sources of pollution.

109. U.S. OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 48.

tion allowed and with regulating groundwater quality by using tools traditionally within the realm of state authority, such as water allocation laws and land use laws. Therefore, the statement would not attempt to set a national policy for whether or to what levels aquifers can be degraded beyond announcing that water of drinking water quality cannot be degraded below drinking water quality.

The federal interest in protecting groundwater is based on preserving a healthy drinking water supply, facilitating commerce and preventing interstate conflicts. The policy statement should affirm that federal involvement in the area and any preemption of state prerogatives will be guided by the extent of federal interest. This policy would allow the extension of federal authority and limitations on the manner and degree of state aquifer protection when federal interests are threatened or offended. For instance, if an aquifer straddled a state or international boundary, if a national industry would be discommoded by a variety of inconsistent state standards or if the nation's supply of drinking water would be put in jeopardy, the federal government would be expected to exercise its authority.

Finally, the policy should recognize a federal financial obligation to protect groundwater, including providing assistance to the states.

B. National Research Program

Extensive groundwater research is necessary for sophisticated national regulatory programs to operate successfully. National research and education programs are also well-suited to pursuing opportunities for waste minimization. Research and development of new monitoring methods are essential for sound design and operation of state aquifer protection strategies. Research can furnish the basis for understanding the resource to be protected and for developing protection and treatment technology. Although none of the several legislative proposals for federally sponsored research programs have been successful,[110] they foreshadow the kind of legislation most likely to pass in the near future. These proposals are relatively nonthreatening but divisions between the Senate and the House over basically hortatory language have stalled their enactment. Perhaps this obstacle could be avoided by announcing a policy of optimal state-federal action.

Cost remains an obstacle to acceptance of an adequate federal groundwater research program. Already hundreds of millions of dollars

110. *See supra* notes 85-90 and accompanying text.

are being spent annually on groundwater management research.[111] The research projects are scattered through a variety of agencies and there is neither a coherent strategy nor a mechanism for avoiding duplication. The cost of new research programs like the one that was proposed in S. 791 at $50 million for the first year, and now in H.R. 37 at $155 million for the first year, must be justified. The returns in improved ability to manage an unseen resource can make the additional expenditures worthwhile if research is carefully targeted and coordinated. But this is difficult in the absence of a policy and regulatory framework to guide research efforts and to use the results. Pure research on interesting questions may increase the knowledge base but may do little to assist in solving groundwater quality problems. Any research bill should comprehend both existing and new groundwater research efforts. If the mechanism for coordinating research is at a high enough level, such as a cabinet or White House official, it should be able to produce far more value from existing research programs.

Progress is being made in developing groundwater monitoring techniques that enable managers to predict and follow the rate and course of underground water movements. New treatment technologies for contaminated aquifers are showing promise. For instance, scientists have had initial success in using microbes to clean up contaminated aquifers. A national commitment and direction to protect the quality of groundwater through coordinated research efforts will help to boost and concentrate these promising initiatives.

C. Coordinate and Expand Federal Regulation

None of the several federal regulatory statutes which help protect groundwater is specifically denominated a groundwater program. The existing programs deal appropriately with a panoply of problems caused by certain kinds of media or activities. For instance, RCRA protects groundwater from landfill seepage but it also protects surface waters, soils, fish and wildlife and other ecological resources from the perils of land disposal of wastes. Furthermore, RCRA guards the health and safety of members of the public from unsafe storage, processing and transportation of hazardous waste during those operations. Likewise,

111. The government spent $890 million in the five years ending with fiscal year 1990 for focused scientific efforts to provide a knowledge base related to groundwater (exclusive of Superfund and other remediation programs). These expenditures are expected to exceed $225 million in the 1990 budget year. U.S. OFFICE OF SCIENCE AND TECHNOLOGY POLICY, FEDERAL GROUND-WATER SCIENCE AND TECHNOLOGY PROGRAMS: THE ROLE OF SCIENCE AND TECHNOLOGY IN THE MANAGEMENT OF THE NATION'S GROUND-WATER RESOURCES (1989).

CERCLA's hazardous waste cleanup provisions confer benefits on land and resources besides aquifers.

Federal groundwater legislation should build on present regulatory programs. Major new federal regulatory thrusts are not needed, but the government must reconcile the various laws and programs that incidentally affect groundwater quality. As discussed above, all need a clearer policy nexus; and some should be amended to strengthen their control of groundwater quality. Significant efforts are needed to develop and implement site specific aquifer protection strategies, an activity that belongs with the states, but requires federal support.

Present laws must be administered coherently. Having a groundwater protection policy mandate will help, but Congress must explicitly deal with duplicative and conflicting functions in existing law. As discussed above, research activities of many agencies must be brought under coordinated management. Inconsistent agency actions are potentially worse than the inefficiencies of duplication. Congress confronted conflicts between EPA's RCRA and CERCLA regulations when it considered amendments to the laws in 1986, but other problems still need attention.[112] A policy statement determining the adequate level of water quality in an aquifer should apply broadly to all related federal activities. This article suggests a nondegradation standard unless a state program allows selective aquifer degradation.

Most importantly, federal regulatory programs must be enhanced to give them greater scope and force in order to protect groundwater better. A groundwater quality legislative package should determine what sources of groundwater pollution are insufficiently controlled by the existing programs. In some cases the laws must be expanded in coverage; in others, Congress need only direct agencies to act more expansively in applying the law to substances and activities that contaminate groundwater.

A 1984 Office of Technology Assessment report cataloged several omissions in the coverage of present federal programs that protect groundwater.[113] The report showed that some contaminants, types of aquifers and contaminant sources have escaped regulation. The omission of contaminants from regulation was partly a failing of agency regulations which are more limited than they need to be under the statutes.[114]

112. *See infra* note 118 and accompanying text.

113. U.S. OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 48, at 63.

114. For instance, the number of substances covered by regulations under TSCA and FIFRA, notes 21-22 *supra*, is very limited. *See* U.S. OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 48. In its 1986 amendments, Congress addressed one major problem noted by OTA when it required

In such cases, Congress may have to give more specific direction to the agencies.

Closing the gaps in coverage of federal laws will require several substantive amendments. For instance, some aquifers are exempt from statutory programs like the underground injection control program of the Safe Drinking Water Act. The Act only regulates injection of wastes into underground water that "can reasonably be expected to supply any public water system."[115] This effectively excludes private wells that are too small or too remote from present population centers to furnish water to a public water system. EPA regulations allow for further exemption of wells based on certain conditions that show the unlikelihood of their becoming drinking water sources.[116]

Several identifiable sources of contamination should be considered for inclusion in existing programs. Recent proposals for legislation to improve regulation of pesticides and toxics, and to address the serious problem of nitrogen pollution were mentioned above.[117] The OTA report lists sources that are largely outside present regulation including above-ground storage facilities such as waste ponds, stockpiles of materials, tanks and their associated pipelines and much mining activity.[118] Septic systems, agricultural chemical use, irrigation, construction excavations and a plethora of nonpoint sources also escape federal regulation. In addition, the phenomenon of saltwater intrusion caused by groundwater pumping has not been addressed.

Not all these gaps in groundwater protection should be filled by expanded federal regulation. Congress will have to make important determinations of which programs and controls belong under federal programs and which fit best within state aquifer protection strategies. Consistent with the legislative policy urged here, these decisions should be informed by the nature and extent of the threat posed to the nation's groundwater and by a judgment as to which governments are able to do the job effectively and efficiently.

There should be a presumption in favor of federal control where: a) contamination problems result from a particular type of source (industrial process, facility or substance); b) the type of source is present in a

EPA to set maximum contaminant levels under the Safe Drinking Water Act for a much larger number of contaminants.

115. 42 U.S.C. § 300h(d)(2) (1982).

116. 40 C.F.R. § 146.4 (1988). The exemption criteria include present or expected use of the well for mineral production, depth so great that it is not now practicable to pump drinking water from it, present contamination or high salt content.

117. *See supra* note 103 (H.R. 2258).

118. U.S. OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 48, at 77.

large number of states; and c) there is an existing program with control mechanisms appropriate to the type of source to be controlled. Control of waste ponds at chemical manufacturing plants is an example of regulation that would fit the presumption in favor of federal regulation.

A presumption should favor state regulation where: a) problems are caused by activities or sources that are either so numerous and diverse or so specific to the area that b) control is best effected by individualized regulatory decisions, particularly decisions in the context of land use or water allocation. The presumption in favor of state regulation would apply to construction excavations, septic tanks and saltwater intrusion.

Many types of sources will demand close judgment calls. Sources like petroleum storage tanks could be regulated by broad federal standards under RCRA. Yet because they are of so many types and their hazards range from grave to nonexistent depending on location, local land use regulation may be best suited to the task. Congress could rationally decide in cases like this to subject the source to federal control, to leave it to the state, or to have the federal government and the state each control aspects of the problem.

It is beyond the scope of this article to propose how every gap in present groundwater protection laws should be filled. Even where the presumptions suggested here seem to support the exercise of federal authority, Congress may or may not decide that the problem merits inclusion in a statutory amendment. For instance, RCRA already provides a framework which sets standards for disposing of and storing hazardous wastes, underground storage tanks and guidelines for state regulation of waste dumps. Congress could amend it to control some additional sources, like industrial ponds and above-ground tanks. Similarly, coal mines are regulated by the Surface Mining Control and Reclamation Act[119] to prevent disturbance of the hydrologic balance. Congress could extend its coverage to other mines in order to protect groundwater. The determination in each instance should turn on a careful review of the nature of particular kinds of groundwater problems in light of the policy and criteria suggested here. If data and time are inadequate to do this well in the context of the legislative process, a groundwater bill could specify some subjects for further study before Congress decides how they will be regulated.

There are some matters where federal attention is rather clearly needed. Better pesticide regulation in FIFRA and more effective, wider use of TSCA would provide important protection for groundwater. And

119. 30 U.S.C. § 1201 (1982).

a truly effective nonpoint source control program, at least one that substantially supported state efforts, would be the single most important federal contribution to groundwater protection. Fuller use of the Clean Water Act could satisfy any remaining need for control of direct discharges into groundwater. Federal regulation could be rather simply extended over point source discharges to groundwater. S. 2091 would have created a substantial regulatory federal program to deal with the problem. As explained above, however, the most widespread problems of groundwater contamination are not traceable to specific, identifiable discharges of pollutants into groundwater. Underground injection was and remains a source of pollution but much of it is covered by the Underground Injection Control program of the Safe Drinking Water Act. To the extent point source problems remain, however, Congress could include a provision in a groundwater legislative package clarifying that the coverage of the Clean Water Act includes discharges into groundwater. It would direct EPA to promulgate regulations bringing point sources that discharge pollutants into groundwater under the regulatory and permitting programs of the Act. This would close a loophole in the Act kept open by EPA's position that the law does not allow it to regulate groundwater. It would also vitiate any need for the kind of major regulatory program envisioned by bills like S. 2091.[120]

D. State Aquifer Protection Strategies

At the heart of the legislative approach suggested here is a reliance on states (including their local goverments) to play a plenary role in individual aquifer protection while the United States protects national interests through a panoply of special regulatory programs aimed at types of sources and substances. The policy choice represented by this approach is based on the belief that the federal government cannot deal as well as the states with the variable hydrologies, contaminant sources or aquifer uses that are involved in guarding the integrity of individual aquifers. Thus, strategies should be designed and applied at the aquifer level where state and local decisions are likely to be better tailored and regulation is likely to be more effective than under a nationally uniform approach.

State-developed aquifer protection strategies need not be federally mandated if the incentives for them are attractive enough. States have

120. None of the many proposals for federal groundwater legislation have included a provision clarifying that the Clean Water Act covers all pollutant discharges, even into groundwater. Apparently alone among the commentators, Professor Dycus has suggested this approach, pointing out that "it would be extremely convenient to use the existing NPDES machinery to control *all* groundwater discharges from *any* source." Dycus, *supra* note 30, at 248.

motives to deal with groundwater protection based on the health and welfare of their citizens. They have been hampered in the past by a lack of knowledge of such problems and how to solve them. Even as more information becomes available, they lack sufficient funds to cope with groundwater protection. Groundwater legislation should provide means to the states to fill the substantial need for effective programs.

To qualify for federal financial assistance, states would have to satisfy certain criteria. The criteria should be framed broadly to encourage creativity. The scope and effectiveness of state programs should not be cabined by overly specific requirements. State strategies should rely neither on federal standards for aquifer quality nor on a particular regulatory framework for achieving state standards and goals. The basic requirements for federal funding would be that: 1) the state set a goal for aquifer protection; 2) the strategy for achieving the goal employ all reasonably available state laws and programs (including water allocation and land use laws) for achieving the goal; 3) achievement of the goal be judged to be technically feasible; and 4) the state provide assurance that all means at its disposal to meet the goal will be diligently employed.

Setting standards for aquifer quality is one of the most important state roles in this proposal. The debate on federal groundwater legislation has often stagnated around the question of how clean aquifers must be. Typically that issue involves three options: nondegradation, limited degradation and degradation based on use.

Some interests believe that a nondegradation policy — preserving all aquifers in the nation at their present quality — ignores the fact that a number of aquifers are basically useless except for waste disposal.[121] Furthermore, a nondegradation policy would prevent the entry of even traces of salts to a pristine aquifer. This may be extremely expensive and result in overbearing restrictions where slight degradation could still leave the aquifer useful and even well above minimum drinking water standards.

Others argue that it is unwise, perhaps arrogant for the federal government to embrace a classification policy that "writes off" some aquifers as subject to degradation. Classification systems have been suggested as means for deciding the level of degradation allowed for a particular aquifer. Criteria such as the existing quality level, present and foreseeable uses for the aquifer and alternative sources to meet demands on the aquifer can lead to classifying an aquifer for various levels of degradation. Opponents of this approach caution that future uses and future

121. Gilbert, *supra* note 24, at 2-37.

ability to clean up existing aquifers are impossible to predict.[122]

A standard for aquifer quality need not and should not be decided as a uniform national policy. It should be done for each aquifer by the appropriate state or local government. The federal government would then follow the state standard for aquifer quality. However, if the state fails to adopt a standard, the standard would be nondegradation. Thus, when the United States was involved in cleaning up or regulating direct discharge of pollutants into an aquifer, the clean-up standard or target for regulation would be nondegradation from the pre-pollution condition unless the state has adopted standards for the aquifer that allow for its degradation. The standard would also apply to discharges and activities of federal facilities unless they were specifically exempted by Congress.

States would be constrained in allowing degradation of waters specifically protected by a federal program. Most notably, in the Safe Drinking Water Act, Congress has perceived a national health interest in protecting the drinking water quality of certain aquifers used for drinking water supplies. In these aquifers the federal drinking water standards would provide a limit on the degradation a state could allow. Congress should extend the applicability of this protection to all aquifers of drinking water quality.

Under the approach suggested here, a state might elect to recharge a high quality aquifer with lower quality but potable surface water. This could replenish an important water source threatened with overpumping. It would allow water storage for seasonal uses. Such degradation seems justifiable at the option of a state (up to the point that it would offend the Safe Drinking Water Act). This approach allows a state to choose to bar all degradation, to allow some limited deterioration of quality of all aquifers, or to classify its aquifers for selective deterioration.

The general criteria that would qualify state aquifer protection strategies for federal funding under the approach suggested here are far different from the detailed requirements for state programs under federal environmental statutes like the Clean Water Act. The compelling reasons for national uniformity and greater federal oversight in those programs are not generally apt in the case of aquifer protection. Others have recommended flexibility in encouraging states to develop their own approaches to groundwater protection, but typically they would impose more detailed federal requirements than are necessary.

The National Groundwater Policy Forum report recommended legislation that required states to submit programs that met certain require-

122. Dycus, *supra* note 30.

ments. It set forth ten components of state programs, six of which would be mandatory.[123] If a state failed to adopt the program it would lose federal grants for environmental remediation.[124] This article takes the view that state programs should not be constrained by highly specific mandatory requirements and that federal financial and technical assistance and incentives are superior to penalties in promoting state action. The Forum's criteria required a classification system to allow different degrees of aquifer degradation. But classification is not necessary to a successful program. For instance, Hawaii's special situation led it to ban all underground injection of wastes from Class I-IV wells.[125] Hawaii and other states may not choose to classify any aquifers for degradation. Indeed, it is doubtful that any one of the mandatory components suggested by the Forum is essential to the success of a state's program. Those that are highly desirable will be adopted by states if the federal government provides enough support for them. For instance, mapping and monitoring programs will be developed by most states which need them if federal grants and technical support were available. But if they are federally required as prerequisites for an acceptable state program, the requirement could actually inhibit state groundwater quality progress. Suppose a state had to comply with a federal requirement that it develop a mapping program as a mandatory component of a mandatory state program or else sacrifice federal cleanup funds. The mapping program could consume scarce state funds needed for a program to control an immediate problem. If, for example, the state knew that nitrogen from agricultural operations was contaminating drinking water in a rural area and wanted to attack the problem immediately it would be ridiculous to sidetrack those efforts in favor of expending scarce time and money on a long-range, state-wide mapping program.

E. Assistance and Incentives for State Programs

States need federal technical support as well as the results of federally sponsored research. To develop and carry out an aquifer protection

123. CONSERVATION FOUNDATION, *supra* note 35, at 14-15: (1) comprehensive mapping of aquifer systems and their associated recharge and discharge areas; (2) anticipatory classification of aquifers; (3) ambient groundwater standards; (4) authorities for imposing controls on all significant sources of potential contamination; (5) programs for monitoring, data collection, and data analysis; (6) effective enforcement provisions; (7) surface-use restrictions to protect groundwater quality; (8) programs to control groundwater withdrawals so as to protect groundwater quality; (9) coordination of groundwater and surface water management; and (10) coordination of groundwater programs with other relevant material resource protection programs. The first six of these components would be required of all state programs.

124. *Id.* at 28.

125. HAW. ADMIN. RULES, § 11-23-04 (1984).

strategy, a state must know about the size, geologic structure, hydrology, and quality of aquifers. Decisionmakers charged with responsibilities for managing groundwater need to know how to evaluate groundwater problems on a technical level and how to compare the relative importance of such problems. The design of regulatory programs and targeting of limited resources also depend on sophisticated techniques of risk assessment.[126] States without sufficient technical assistance and data in all these areas will not be able to make full use of regulatory tools. They may be doomed to performing unacceptably or not at all. Until states have the advantage of such assistance, their performance in controlling groundwater quality cannot be fairly judged.

Sufficient funding is the key to a successful national policy of optimizing federal and state participation in groundwater protection. Once Congress has set existing groundwater-related programs on a consistent policy course and has determined where federal regulatory authority should be expanded, the design of aquifer protection strategies is up to the states. State programs can be effective with efficient research, technical assistance and creativity. Federal guidance in finding alternative approaches could be invaluable. States that commit themselves to developing and implementing effective strategies to control threats to groundwater quality should then be rewarded with federal financial assistance.

Without federal financial assistance, most states will be unable to do an adequate job of developing aquifer protection strategies. Several states are financially stressed and either cannot or will not take on additional financial burdens for pollution control.[127] Thus, a federal role in spending and furnishing assistance in identifying new sources of funds is unavoidable if states are to respond with their own adequate and effective programs.

Possibilities for funding state programs include a system of economic incentives or disincentives attached to desirable or undesirable citizen conduct. For instance, depletions that cause contaminant intrusion can be discouraged by the imposition of a depletion charge or pump tax

126. For an understandable summary of major issues in groundwater control technology and decisionmaking in the context of aquifer restoration, see L. CANTER & R. KNOX, *supra* note 48.

127. A recent EPA study shows that by 1993 states will need $82 million more annually to meet their new responsibilities under the 1986 Amendments to the Safe Drinking Water Act. OFFICE OF WATER, U.S. E.P.A. PAYING FOR CLEANER WATER. STATE FUNDING STUDY (1988). At present, it costs states about $95 million a year to run the program of which EPA provides approximately $31 million. The EPA study is an example of the federal government providing assistance in identifying possible sources of funds for desirable but federally induced programs.

and the revenues can then be used for groundwater programs.[128] Effluent charges are another possibility in cases where unregulated discharges affect groundwater.[129] Subsidies and compensation may be appropriate economic incentives for farmers who retire highly saline farmland or who agree to stop using a well in which they hold water rights where pumping causes pollution of an adjacent aquifer.

If there is a national purpose to be served by protecting the quality of the nation's groundwater, Congress should be willing to help finance well-designed state programs. Congress should resist the tendency it has shown in recent years to let the states struggle to fund their own programs and it should depart from recent trends in federal environmental spending that show a generally stingy attitude toward supporting groundwater-related programs.[130] Federal funds can move an impecunious or equivocal state to fashion and enforce programs that fulfill national goals. For instance, well depletion may cause saltwater intrusion, surface subsidence, loss of wetlands, reduced streamflows and diminished stream quality. A range of federal programs would be implicated by the resulting contamination, including programs from environmental protection and mitigation to water project operation. Once an aquifer becomes polluted, it could become the subject of massive federal funding as a Superfund site. Ultimately, it may be more economical to provide federal funds for state aquifer protection programs than for the United States to deal with the consequences.

Congress should authorize a program of financial incentives to states that undertake programs to address groundwater quality problems effectively according to the guidelines developed for aquifer protection strategies. The guidelines should include components of land use and water planning that deliberately protect groundwater. Federal support for nonpoint source programs is now lean. It could be enhanced with incentives to control the types of nonpoint sources that contaminate ground-

128. The idea of a depletion charge is mentioned in Murphy, *supra* note 48, at 86. The article puts the need for groundwater quality control in a broad context and adds international perspectives.

Compare Florida's groundwater pumping permit system, which allows the creation of districts with authority to tax local property owners, to finance recharge programs that will help prevent saltwater intrusion and other pollution caused by overly rapid pumping. FLA. STAT. ANN. § 373.106 (West 1988).

129. *See* Note, *supra* note 29, at 787-91, proposing an effluent charge system for dischargers of pollutants that may contaminate groundwater. Because most groundwater contamination is not easily traceable to dischargers and the scope of actual contamination by uncontrolled discharges appears to be narrow, this device is likely to be used only in limited circumstances.

130. For example, Congress never funded the National Groundwater Commission created by the 1984 RCRA amendments to recommend how to satisfy the need for more information about groundwater. 42 U.S.C. § 6901 (1982). RCRA funds for solid waste management have been totally eliminated in some years. *See* U.S. OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 48, at 69.

water. Perhaps matching federal funds should be available for state programs that raise their own groundwater protection funds. Federal agencies have an important role in helping states find options for structuring and funding their programs, and in guiding them as they develop those programs. An incentive program should be as wide as the creativity of the states, however, and should not simply reward states that follow a federal formula.

V. CONCLUSION

The elements needed for a national groundwater program have been cataloged and discussed in scholarly articles, studies and congressional bills. It is now timely to incorporate the best of these proposals into national legislation. This effort should not be bogged down by collateral issues such as which federal agency should oversee research. It should focus on fundamental questions like how to provide incentives sufficient to induce necessary state action. The legislative approach suggested here would draw on the capabilities of all levels of government to control groundwater quality.

Federal legislation is needed to coalesce and strengthen existing state and federal groundwater protection efforts. The legislation should look to each level of government to improve on the initiatives they have made. Groundwater protection demands that both the federal government and the states use their special competencies and sovereign prerogatives. Federal pollution laws provide a good start in satisfying federal responsibilities. These laws need to be expanded and bolstered. But the greatest enhancement in national groundwater protection is needed at the state level. States should have primary responsibility for setting the levels at which aquifers within their boundaries will be protected and for tailoring strategies so that they will meet the standards set. The federal government's role in aquifer management can be indirect, providing the technical and financial assistance necessary for development of state strategies and programs that are of sufficient quality and scope.