ENFORCEABLE STANDARDS TO ABATE AGRICULTURAL POLLUTION: THE POTENTIAL OF REGULATORY POLICIES IN THE ISRAELI CONTEXT

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I. Introduction

The pollution profile around the world is changing. Cases in which it is possible to single out a problematic, monolithic, industrial point source discharger that is responsible for an environmental problem and to neutralize it with the "magic bullet" of an enforcement action are becoming increasingly rare. Instead, acute pollution problems are typically a result of numerous small dischargers. Air pollution episodes and unreasonable exposures are the result of automobile emissions, dry cleaning operations, and heating. In the context of water quality, it has been clear for some time that damage from "non-point source" agricultural sources often dwarfs the impact of effluents from industrial sources.[1]

In Israel, for example, nitrate levels have doubled over the past thirty years, and current average concentrations in most of the coastal drinking water wells exceed United States and even recommended Israeli levels.[2] The pollution is attributed primarily to over-fertilization by farmers.[3] Reports suggest that toxic chemicals such as benzene and pesticides have also percolated into Israeli aquifers largely due to intensive irrigation by farmers with inadequately treated waste water.[4] The rise in salinity, largely due to salt

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1 *See* P. Rogers & A. Rosenthal, *The Imperatives of Nonpoint Source Water Pollution Policy*, 60 J. Water Pollution Control Ass'n 1912 (1988).

2 *See* State Comptroller, Report on the Management of Water Supply in Israel 23–26 (1990).

3 J. Whitman, The Environment in Israel 126 (1988).

4 The first documentation of the problem that appeared in the peer-reviewed literature was

water intrusion, can be indirectly attributed to over-pumping to meet excessive agricultural demands.[5]

The situation in Israel is not unique. In the United States, the dominant contribution of non-point source and, in particular, agricultural discharges to degradation of water sources is extremely well documented. While this article will not focus on soil erosion, statistics on a national and global level suggest that here, too, agricultural mismanagement plays a similar role.

The encouraging news is that "low technology" agricultural management practices, which can reduce discharges considerably, if not eliminate them altogether, have been available for many years. These practices, frequently called Best Management Practices or "Management Practices," include a range of technical options, from terracing and retention ponds to changes in pesticide and fertilizer applications. The challenge facing environmental policy-makers is how to induce polluting farm operations to adopt these management practices.

Diffusion of these technologies, however, has proven to be a daunting task. Although environmental problems with an impact as dramatic as non-point source agricultural pollution are usually addressed through command and control regulation, such a policy has been avoided not only in Israel, but in most Western countries. Farmers and their representatives around the world typically greet even the vaguest reference to government interference in their work with indignation. There are, of course, well considered objections to such an approach.[6]

L. Muszkat *et al.*, *Large Scale Contamination of Deep Groundwaters by Organic Pollutants*, 11B Advances in Mass Spectrometry 1628 (1990).

5 A. Pruginin & J. Glass, Environmental Quality in Israel, 2000–2025, at 56 (1992).

6 Interview with Reuven Osher, Pesticide Division, Israel Ministry of Agriculture Extension Service, in Tel Aviv, Isr. (Dec. 27, 1993). For a general description of the perspective, see D. Kleckner, *Conservation Programs, Mandatory or Voluntary*, 43 J. Soil & Water Conservation 358 (1988) (the author was President of the American Farm Bureau Federation). Peter Meyers, Assistant Secretary at the United States Department of Agriculture, expressed the Department's continued opposition to land use regulation as follows:

> From the outset I must emphasize that USDA is skeptical about the regulatory approach to correcting nonpoint source problems. Regulation does not work well in the agricultural sector. Although the voluntary approach now used in USDA's conservation programs is not perfect, it is far more palatable — and far more effective and less costly — than the alternative . . . There is little reason for the federal government to become more involved in land use regulation, particularly in the agricultural sector.

It has been suggested on occasion that Israel's environmental authorities lack the authority to impose a regulatory system on agricultural discharges. An argument raised even more frequently by opponents is that traditional command and control policies constitute an inappropriate and inequitable response to agricultural pollution, which can only be abated through voluntary educational and economic incentive programs. Moreover, critics posit that from a practical perspective, there is no effective way to design a permit for an agricultural operation that will be both comprehensible to the farmer and enforceable by regulatory field inspection personnel.

Opposition to command and control regulation of agricultural pollution unfortunately takes into consideration neither the empirical success of existing regulatory programs in the United States nor their potential importance in designing a comprehensive national environmental policy for Israel. While certainly more effective when utilized in conjunction with supplementary educational and cost-sharing initiatives, agricultural permitting programs may be the key to reversing what has emerged as a central hazard to water quality in many countries around the world. Analysis, therefore, should focus on the way in which a permit for agricultural operations is crafted, the overall institutional regulatory context in which a permit is implemented and enforced, as well as on the actual substantive measures required.

This article will begin with an evaluation of the statutory basis for environmental regulation of agriculture in Israel. Positions opposing such regulation on philosophical grounds will be considered within a traditional environmental paradigm. The article then will offer a description of the legal frameworks governing U.S. command and control programs for controlling agricultural pollution, with emphasis on the practical problems facing such programs, which strive to be simultaneously effective and fair.

II. The Law Governing Agricultural Pollution in Israel: Unrealized Potential

Is there a statutory framework currently in place to allow environmentally-based regulation of farm operations in Israel, or are discussions on this subject strictly theoretical in nature? The answer is straightforward. While no single environmental law is directed specifically at the agricultural sector, several statutes include broad measures that affect agricultural pollution which can be wielded accordingly. Arguably, the four most important

statutes are the Water Law, 1959,[7] the Plant Protection Law, 1956, the Licensing of Businesses Law, 1968, and the Public Health Ordinance, 1940. Each statute fulfills a fundamentally different function within a potential pollution protection scheme. A brief description of their relevant provisions is essential for demonstrating the availability of a statutory infrastructure for a national command and control agricultural pollution strategy within Israel.

1. The Water Law, 1959

The Water Law, 1959, established a comprehensive framework for the control and protection of Israel's water resources.[8] A conceptual basis is established for regulation of agriculture in the first chapter, (L.S.I.) which declares that "all sources of water in Israel are public property," and that "[a] person's right in any land does not confer on him a right in a water resource situated therein or crossing it or abutting thereon."[9] In 1971, the Law was amended to include a new chapter devoted entirely to prevention of water pollution. Although implementation of the chapter's provisions has been irregular, they nonetheless offer a formidable basis for addressing agricultural pollution.

The Law defines water pollution extremely broadly to include almost any impact on a surface or groundwater source.[10] A broad prohibition on

7 Water Law, 13 L.S.I. 173 (1958–59). Extensive amendments expanding the scope of the law to treat water pollution were passed in 1971 Water (Amendment No. 5) Law, 26 L.S.I. 7 (1971–72)).

8 Under the provisions of the Law, responsibility for managing Israel's water resources is divided among the Minister of Agriculture, the Water Commissioner, an appointed Water Board, and the Minister of the Environment. The Minister of Agriculture is responsible, *inter alia*, for prescribing the norms for the quantity, quality, and utilization of water, including rationing when necessary. Included amongst the management practices that the Minister is authorized to impose is the establishment of "protective strips" around water resources "for the purpose of preserving any water, water source, water works or any installation for the extraction, storage or conveyance of water . . . entry to and passage through which shall be prohibited except under a permit from the Water Commissioner . . . ." The Minister of the Environment is authorized to promulgate regulations, in coordination with other government ministers, to prevent the pollution of water resources; *see* Article 20A of the Law in *infra* note 11.

9 Water Law §§ 1, 4.

10 Article 20A of the Water Law states:

> 20A. In this article —
> "water pollution" means a change in the properties of water in a water resource in physical, chemical, organoleptic, biological, bacteriological, radioactive or other respect, or a change as a result of which water is dangerous to public health or likely to harm animal or plant life or less suitable for the purpose for which it is used or intended to be used;
> "water resource" has the meaning assigned to this term in section 2, but includes also water carriers, both open and closed, water reservoirs and drainage channels...

polluting water from any source[11] serves as the normative foundation for pollution abatement activities in the agricultural sector. The Water Commissioner, a government appointee, is responsible for enforcing the Water Law and the regulations promulgated pursuant thereto and for maintenance of water quality. The Commissioner is authorized to order a person who has failed to comply with the water conservation requirements to meet those requirements. He or she is also authorized to take measures to prevent any damage to a water source that results from non-compliance (the costs of which can be charged to the offender), to set conditions for the prevention of water pollution in consultation with the Minister of Agriculture or the Minister of the Environment, and to take necessary actions to stop water pollution and to restore polluted water sources to their original quality.[12]

The Minister of the Environment, although not a major player under the Water Law, is empowered to establish regulations that will regulate farming activities insofar as they may impact water resources:[13]

> 20D. (a) To prevent water pollution and protect waste resources from pollution, the Minister of the Environment may, after consultation with the Water Board, make regulations prescribing, *inter alia*, restrictions, prohibitions, conditions and other provisions as to —
> (1) the location and establishment of specified polluting elements; such regulations shall require the approval of the Economic Committee of the Knesset;
> (2) the use of certain substances or methods in the production processes, operation and use of a polluting material, *including soil cultivation and also fertiliser application and crop spraying*; any such regulations shall be made in consultation with the Minister of Health (emphasis added);
> (3) the manufacture, importation, distribution and marketing of

11 Water Law § 20B.

12 Water Law ch. 1A.

13 After the establishment of the Ministry of the Environment, authority was transferred to the Minister of the Environment to enact regulations to protect water quality and prevent water pollution pursuant to Government Decision Number 525 from April 1990.

> certain substances and products; such regulations shall be made in consultation with the Minister of Commerce and Industry and prior notice thereof shall be given to the Economic Committee of the Knesset. . . .

The use of the authority to establish such norms always existed and lay dormant for almost twenty years, until the transfer of authority to the Ministry of the Environment that accompanied the establishment of the Ministry in 1989. Soon thereafter, two sets of regulations were promulgated that delimited activities on aerial spraying of pesticides and the rinsing of pesticide application equipment.[14]

2. The Plant Protection Law, 1956[15]

The establishment of the Ministry of the Environment in 1989 did not affect the authority to regulate pesticides, a function that remained solely in the hands of the Minister of Agriculture, as per the Plant Protection Law, 1956. The Law authorizes the Minister of Agriculture, following consultation with an advisory committee appointed by him or her and consisting of public representatives and government workers, to regulate "the sale, distribution, packing, and import of chemicals intended for the extermination of pests," and take action to exterminate, or enact regulations to "prohibit the carrying on of the extermination of pests without a licence and prescribe conditions for the grant of a license" for their use. The Minister may also make regulations as to the safe use of pesticides or may forbid or limit the use of certain pesticides if he or she finds them to be dangerous to human health. Although the Law established a Pesticide Committee composed of public representatives,[16] the Committee has no authority to make operative decisions regarding pesticide registration and standards for application.

There is some speculation as to whether the 1993 Hazardous Substances Law[17] will be utilized by the Minister of the Environment to expand the

14 Water Regulations (Prevention of Water Pollution) (Rinsing Spraying Equipment), 5320 *Kovetz Takanot* [K.T.] 470 (1991); Water Regulations (Prevention of Water Pollution) (Absorbing and Septic Tanks), 5421 K.T. 784 (1992).

15 Plant Protection Law, *Sefer HaHukim* [S.H.] 206 (1956) (amended in 1966, 1970, and 1982) *See also* Plant Protection Law, 10 L.S.I. 75 (1955–56).

16 The Committee is to include at least one representative each from the Ministry of Health, the National Parks Authority, and the Nature Reserves Authority.

17 Hazardous Substances Law, S.H. 1408 (1993). The *Knesset* (the Israeli parliament) passed this legislation on January 5, 1993.

Ministry's activities into the area of pesticide use. Under this statute, licenses are required for the sale and usage of any hazardous substances.[18] In the appendix to the statute, there is an enumeration of materials considered hazardous for the purposes of the Law, and many pesticides appear on this list.

3. The Licensing of Businesses Law, 1968[19]

The Licensing of Businesses Law is a far-reaching statute with potentially enormous environmental implications. Under the Law, the Minister of the Environment is empowered to stipulate operating conditions in business licenses,[20] the role of which is to guarantee "appropriate environmental protection, appropriate sanitary conditions, the prevention of nuisances and annoyances and compliance with the provisions of the laws relating to planning and building."[21] The decision regarding which businesses are subject to the Law rests with the Minister of the Interior. In consultation with the Minister of the Environment, he or she is authorized to designate and define by order businesses requiring a license.[22] In cases where licenses are intended to reduce the risk of animal diseases or water pollution from pesticides, fertilizers, or medicines, the Law requires consultation with the Minister of Agriculture.[23]

The licensing system is a two-tiered process. Actual implementation of the Law is delegated to local municipal authorities. Regional councils and municipalities are designated as the licensing authority in the jurisdiction of a municipality or local council; when this is not applicable, a person authorized by the Minister of the Interior serves as the licensing authority. In parallel, license applications may be approved by a person empowered to do so by the Ministers of the Environment, Police, or of Agriculture, as the case may be, all of whom have the authority to stipulate "special conditions" of licenses.

Anyone operating a business without a license or a person in contravention of the Law or its regulations is liable to a fine or imprisonment of up to six

18 §§ 3–5, S.H. 1408.

19 Licensing of Businesses Law, 22 L.S.I. 232 (1967–1968).

20 According to Government Decision Number 525, businesses whose licenses remain under the supervision of the Ministry of Health (and not the Environment) include cosmetics, food, medical supplies, and pharmaceuticals.

21 § 1(a)(1), 22 L.S.I. 232.

22 §§ 6, 7, 22 L.S.I. 232.

23 § 1, 22 L.S.I. 232.

months. The court may also order the closure of the business. Anyone who refuses to present his or her business license to an official upon demand is liable to be fined or imprisoned for up to three months.

4. The Public Health Ordinance, 1940[24]

This ordinance, an expanded version of a British Mandatory ordinance, has provisions that range from the regulation of hospitals to issuance of death certificates, and it is important in two respects. Part 6 of the statute is directed at the regulation of nuisances and defines nuisances with a long casuistic list of impacts. Pursuant to section 53(c), this includes:

> [a] stable, dairy, or other buildings used to serve as dwellings for an animal or animals that are held in such a place or in such a manner that they damage health or endanger health or any animal held in such a place or any animal that is held in a manner or in number that damages health or threatens to damage health.

Although the authority to issue administrative orders to remove such nuisances rests with local authorities,[25] the district representatives of the Minister of the Environment, in their capacity as Regional Sanitary Authorities, are empowered to force heads of regional councils to abate such nuisances.[26] If local authorities do not respond, Ministry of the Environment regional directors can assume these authorities and can undertake the clean-up or necessary abatement action, charging the costs to the polluting operation.[27]

The Public Health Ordinance is also important insofar as it is the enabling statute that authorizes the Minister of Health to grant permits for the re-use of waste water. Pursuant to section 65A, the Minister of Health issued the legally binding Public Health Norms (Treatment of Waste Water Designated for Irrigation), which set quantitative standards and created a permitting system whereby waste water use requires a permit from the Regional Sanitation Engineer in the Ministry of Health.[28] Inasmuch as a great deal of the chemical contamination of groundwater can be traced to irrigation with

24 The Public Health Ordinance was first published in the Official Gazette of the British Mandatory Government and has been amended many times, most recently in 1993 (S.H. 1428 (1993)).

25 *See* §§ 54–56, S.H. 1428.

26 § 61A, S.H. 1428.

27 § 61A, S.H. 1428 (relating to 55(10)).

28 4263 K.T. 1357 (1981), *amended by* 5273 K.T. 718 (1990).

inadequately treated effluents, enforcement of the quantitative standards appears to be a crucial step in reducing agricultural pollution.

5. Unrealized Statutory Potential and Institutional Orientation

The four above-mentioned statutes provide a sufficient basis for the establishment of a formidable regulatory system for agriculture in Israel. General operating standards can be issued through regulations under the Water Law and Plant Protection Law. Regulations to limit pesticide applications near surface water sources serve as excellent examples of the relative ease with which such regulatory norms can be enacted. Furthermore, the Water Law authorizes the Minister of Agriculture to establish in-stream ambient standards for relevant agricultural pollutants.

One can hardly imagine a stronger enabling statute for the establishment of a permit system for agricultural discharges than the one created by the Licensing of Businesses Law. Nevertheless, reality invariably proves to be more complex. Indeed, the Ministry of the Environment's decision to require certain new livestock operations to operate according to the terms specified in a business license faced a legal challenge in the Supreme Court. The petitioner, a geese feedlot, argued that since the Ministry had not stipulated environmental conditions for all goose farms, its demands (which ultimately led to a stop building order by the Regional Planning Committee) constitute discrimination.[29]

On the whole, the Ministry of the Environment, which suffers from inadequate personnel and whose policy vis-à-vis agricultural pollution has traditionally been ambivalent, lacks both the political will and the resources to utilize the Licensing of Businesses Law to stipulate emission or performance standards for the host of agricultural operations and activities that are specified in the Law. Instead, Ministry officials perceive intervention by the Ministry of Agriculture as essential for ultimate success in reducing agricultural pollution and point to the range of agricultural benefits (*e.g.*, milk and water quotas, subsidies, etc.) that might be used to leverage modification of agricultural practices.[30]

Beyond this range of unconventional, administrative remedies, the Ministry of Agriculture also wields a potentially formidable enforcement presence

29 H.C. 4169/93, Yallin v. State of Israel (unpublished).

30 Interview with Rachel Adam, Senior Advisor to the Ministry of the Environment Legal Advisory, in Jerusalem, Isr. (Dec. 23, 1993).

in its extension services, known by the acronym "*Shaham*." The *Shaham* staff encompasses approximately 350 workers, of which 180 to two hundred are regional counselors, another fifty to sixty are technical advisors on the national level, and an additional forty serve as laboratory workers. However, like most extension services, *Shaham* has a policy of disassociation with any and all enforcement activities, even those performed by Ministry of Agriculture institutions (*e.g.*, the Water Commission). Viewing farmer trust and cooperation as essential to the fulfillment of *Shaham*'s mandate to provide technical support to agriculture, *Shaham* agents limit their environmental intervention to educational sessions and to gentle attempts at persuading farm operators that off-site damage not only harms their neighbors, but also may ultimately show inefficiency.[31] Their vision of enforcement involves external government agencies acting in a regulatory capacity, setting and enforcing performance standards. Accordingly, *Shaham*'s role is to find solutions and to provide the technical support necessary for meeting these prescriptions.

Ultimately it cannot be argued that the absence of regulatory agricultural programs in Israel is not a legislative problem. The Environmental Authority has the statutory power to impose environmental conditions and specifications on farmers, and the Ministry of Agriculture has the personnel to enforce them. The conclusion is that political will is the only real obstacle to remedying present-day neglect and implementing a comprehensive environmental command control scheme for agriculture. Thus, before presenting potential regulatory approaches, we must first consider the arguments that reject the concept of agricultural regulation as either unfair or ineffective that lie at the heart of the current feeble political resolve.

III. Regulation of Agricultural Pollution: The Principal Objections

Beyond the practical problems with enforcing the environmental standards contained in individual permits, several philosophical justifications are offered as reasons for departing from traditional "polluter pays" regulatory policy. It is argued, for example, that the agricultural sector plays a unique role in ensuring a nation's economic security and that it is a principle of Israeli foreign policy. Agricultural advocates also contend that the burden imposed by tough pollution controls without subsidies is inherently unfair relative to the small-size operational units of the industry and will invariably force small operations out of business. Finally, it is argued that national self-sufficiency and physical security have intrinsic ethical merits (particularly within the context of Zionist ideology) and are ultimately dependent upon agricultural productivity. Hence, national policy should support farming in every way possible. To what extent are these positions consistent with reality and with the legal principles that govern environmental issues?

31 Frequently *Shaham* agents are privy to incriminating information regarding yields that suggest income tax evasion, but if we don't know the amount of flowers which a greenhouse produced, we can't do our jobs. So we have a very strict policy of being "on the farmer's side" in order to maintain their trust.

Interview with Moshe Sneh, Director of *Shaham* Field Service, in Tel Aviv, Isr. (Dec. 20, 1993).

The flaws in the first two positions presented above are fairly apparent. Any number of industries play as important a role in a nation's foreign policy as agriculture does, and their exports contribute to maintaining a favorable balance of trade.[32] Does reliance on a massive military industry justify allowing that industry to threaten public health with unreasonable pollution levels? Certainly no nation would seriously consider suspending the normal criminal prohibitions that delimit the conduct of such an industry. Inasmuch as most environmental standards are imposed within the framework of criminal law, the "anonymity" of the victim is hardly a reason to grant functional immunity from water quality standards.

The effect of farm size on the equity of an environmental policy is also questionable. Several other industries comprised of small production units (*e.g.*, electroplating) have been forced to install costly controls on effluents and emissions.[33] Despite the ensuing economic dislocation and even bankruptcies, the public has not been willing to grant exemptions from environmental responsibility to such enterprises.

A dependable food supply is one of the cornerstones of any nation's political and economic independence. Certainly, there are few industries that can claim to produce a "necessity," and in the long-run, Israel should not anticipate massive food imports, given the growth in world population.

32 The Dead Sea Works Concession Law, 1994, which exempted one of Israel's largest producers from planning and building legislation, is a classic example of an industry's successful attempt to exploit its power to evade environmental standards in the economic equivalent of "might makes right."

33 The Ministry of the Environment has issued directives for this industry.

Even so, there are many plausible responses to counter this position. To begin with, water is also a necessity, and the protection thereof is of paramount priority. Moreover, in view of the present surpluses and of the prodigious exports of agricultural products, it is doubtful that even the toughest environmental regulations will devastate Israeli agriculture. There are many prosperous farms that, for generations, have taken the necessary steps to preserve their soil and to eliminate discharges. Their prosperity poses a challenge to the cataclysmic vision of agricultural ruin if control measures are required in lieu of incentive programs.

Why then should the public invest in expensive cost-share programs and subsidize pollution control? Perhaps the most powerful argument proffered by opponents of regulation and permitting is a pragmatic one: without an accompanying policy based on education and economic incentives, agricultural pollution control policies simply will not work. The ideological or moral implications of financial incentives or cost-sharing (*i.e.*, society helps the polluter pay) are irrelevant. If a nation wants clean water and farmers who practice environmentally sound management, it must muster the necessary funds to subsidize programs for agriculture.[34]

This position, however, is not compelling. Empirically it does not explain why the environmental situation in so many countries has degenerated with regard to agricultural pollution, despite the existence of extensive volunteer-based economic incentive programs.[35] There are several arguments that criticize specific aspects of incentive programs for farmers that go beyond "argument by assertion" and explain "why cost-share programs have not worked." When compiled, this litany of criticism constitutes a powerful

34 As Neil Sampson, President of the American Forestry Association and a prominent commentator on conservation policy, writes, "Protecting farmland will naturally need to be done by farmers. But the costs, in large measure, must be willingly borne by non-farmers either in the cost of their products, in government funded incentive programs or in some combination of both." N. Sampson, Farmland or Wasteland, A Time for Choice (1981).

35 The United States, for example has a long history of "cost-share" programs, in which the expense of approved management practices is offset by direct government grants (*see* U.S. EPA, Share the Cost Share the Benefits, Agricultural Non-Point Source Cost-Share Programs, EPA Manual (1990)). Nevertheless the record of soil conservation programs in the U.S. is not encouraging regarding cost-sharing as a comprehensive environmental solution. For example, several studies have indicated that erosion problems are consistently underestimated by farmers and the costs of practices are overestimated. These kinds of impediments to erosion abatement policies would seem to be even more pronounced in the context of water quality programs.

indictment for non-regulatory programs as a principal agricultural policy approach:

(1) Cost-sharing does not pay for operation and maintenance, suggesting that the longevity of control measures will be minimal.[36]

(2) Cost-sharing relies solely on the profit motive, which often drives farming toward high input and toward polluting practices, particularly when government economic incentives do not compete with those of the marketplace.

(3) Cost-sharing programs are administered by agricultural officials who are not trained to pursue water quality benefits. Hence, despite statutory directives, they direct programs at erosion control and continued productivity.[37]

(4) Cost-sharing discourages "altruistic/responsible" land management among farmers who do not receive funds. Although voluntary programs undoubtedly increase management practice implementation among some who might not have installed these practices otherwise, many farmers who had intended to modify land practices take a "wait for funding" position about management practice implementation.

(5) Cost-sharing programs are administered by soil service technicians, for whom the enforcement and penalties for violation of contract provisions are anomalous.

(6) Incentives or sanctions cannot be directed at non-participating farmers.[38]

(7) Cost-sharing programs do not always reach environmentally irresponsible operations. Participants tend to be individuals for whom management practice implementation predates the intervention.[39]

(8) Ultimately, there will never be sufficient funds to treat more than a small percentage of the non-point problems.[40]

The Natural Resources Council, a U.S. environment group, published its position regarding non-point source pollution in its 1989 treatise *Poison*

36 A. Rosenthal, *Permitting Farmers, A Guide to State Orientations*, U.S. EPA Internal Rep. Reg. Innovations Staff (Sept. 1987).

37 Rogers & Rosenthal, *supra* note 1.

38 P. Feldman & M. Roberts, *Magic Bullets or Seven-Card Stud, in* Understanding Health Care Regulation 66 (1981).

39 *See* D.T. Massey, *Overcoming Constitutional Restrictions to Permit Property Tax Incentives for Soil Conservation Programs*, 29 S.D. L. Rev. 24, 27 (1983).

40 J. Cook, *Agricultural Nonpoint Pollution Control: A Time for Sticks?*, 40 J. Soil & Water Conservation 105 (1985).

Runoff, in which the Council's primary objections to non-regulatory approaches were summarized as follows:

> The instability and low income of farmers combined with the relatively low or negative profitability of control measures (management practices) designed to protect water quality means that non-point source programs based on voluntarism, altruism, and limited incentives will not be effective . . . Conservation never has and never will drive farm policy . . . If even the broader goal of conservation (*i.e.*, soil loss prevention) cannot be promoted effectively through voluntary programs, it is axiomatic that such programs will not achieve water quality goals.[41]

IV. Toward a Regulatory Approach to Agricultural Pollution: The American Experience

As political culture evolved during the 1970s and 1980s, the number of farmers in the U.S. dwindled along with their political clout. Consequently not only was the previously "unthinkable" discussed, but in many states, it became a reality. What had once been an arcane opinion held by a few extreme environmentalists became "mainstream" public sentiment. For example, in its July 1989 cover feature on the environment, *Newsweek* editorialized that federal regulation of agriculture was the single most important policy change needed to improve the environment and water quality. This transition was partially the result of a shift in policy objectives from control of erosion to control of runoff. Pierre Crosson, a leading commentator on conservation policy, wrote that

> Although as a society we may believe farmers should spend more for conservation than they think is economical for them to spend, we cannot very well require them to do it. At least we have not so far been prepared to try. With the emergence of off-farm damage as the major erosion threat, this perspective on voluntarism may change. By definition, farmers have no incentive to reduce off-farm damages of erosion from their land because they do not suffer them. Those downstream do. With respect to off-farm damages, therefore, the farmer is in the same position as the industrial polluter. We do not hesitate to impose

41 P. Taylor, Poison Runoff 48, 50 (1989).

> regulations backed by sanctions on the latter. Why should we treat the farmer differently?[42]

Proponents of regulation, while not maligning the character of farmers, *per se*, argue that the economic pressures farmers face overwhelm their commitment to stewardship. This view is supported by numerous sociological studies:

> Research overwhelmingly indicates that farmers continue to use practices that degrade the land resource even when (a) they are aware of erosion problems, (b) they believe they have a social responsibility to protect land, (c) they have favorable attitudes towards soil conservation and (d) they have the knowledge required to prevent soil erosion.[43]

For example, in one study, thirty-one percent of farmers acknowledged a severe pollution problem in their watershed, but only six percent felt their farms contributed to it.[44]

Because the individual contribution made by most farms to a water quality problem is relatively small, disregard for externalities can be particularly pervasive. When damage occurs far downstream, it is unrealistic to expect farmers, acting as rational profit maximizers, to control the pollution leaving their lands. Voluntarists cite on-site economic benefits of management practices as sufficiently great to counteract this phenomenon; yet economists identify market failures that call this view into question, including:

> (a) differences between the social and private rate of discounting . . . ; (b) failure in the land market if land prices do not reflect the lowered productivity of eroded soils; (c) failure due to differences in property rights because tenant farmers do not have long-term incentives that owner-operators do; and (d) financial time or information constraints on the individual decision-maker that can result in decisions not always in society's best interest.[45]

42 P. Crosson, *New Perspectives on Soil Conservation Policy*, 39 J. Soil & Water Conservation 222 (1984).

43 S.B. Lovejoy & T.L. Napier, *Conserving Soil, Sociological Insights*, 41 J. Soil & Water Conservation 304 (1986).

44 W.R. Kerns & R.A. Kramer, *Farmers' Attitudes Toward Nonpoint Pollution Control and Participation in Cost-Sharing Programs*, 21 Water Resources Bull. 207 (1985).

45 J.J. Fletcher, *Conserving Soil, Economic Insights*, 41 J. Soil & Water Conservation 314 (1986).

Moreover, several studies indicate that land users will actually lose money as a result of implementing certain control measures for agricultural control.

Indeed, farmers all over the world are increasingly becoming accustomed to government involvement in their agricultural activities, suggesting that their resentment toward regulation might be waning, which enhances the likelihood of compliance. Indeed, almost every aspect of Israeli agriculture is regulated, from crop quotas to export size and from quantity of fruit production to pesticide residues. A 1989 review of fifteen surveys on the attitudes of U.S. farmers (generally considered much more resistant to regulation than other sectors of the population) revealed that the opposition farmers showed in the past to command control solutions has lessened in recent years. Not surprisingly, the degree to which regulation is regarded as acceptable increases relative to the level of conservation already practiced by a farm operation. Cost-sharing also increases the degree of acceptability of these programs.[46]

V. Toward a Regulatory Program for Agricultural Pollution

The mechanics of running a regulatory program to control agricultural pollution, while formidable, are not insurmountable. The remainder of this article will describe different environmental legal frameworks that have been successful in reducing agricultural pollution, while highlighting some of the specific administrative and substantive aspects of regulation that appear to be effective.

A brief description of the legal framework behind different agricultural pollution regulatory programs will be offered. This will be based largely on what has transpired in the U.S., where such programs emerged in the late 1980s. This will be followed by a substantive examination of the form and contents of permits, which lie at the heart of most regulatory programs. Finally, specific aspects of the enforcement systems that oversee implementation of these regulatory programs will be discussed. Although the conclusions are based on the record of command and control programs, they also provide insight for oversight of a financial incentive program in agriculture.[47]

46 Wisconsin Comm. to Develop a Regulatory Approach to Soil Erosion and Nonpoint Pollution Control, *State Regulation of Soil Erosion*, 44 J. Soil & Water Conservation 210 (1989).

47 Wisconsin's "Farmland Preservation Program" offers tax credits to farms that operate according to an approved sediment plan that ensures soil loss at a rate no greater than "T. While technically, the Wisconsin program is "voluntary," the 23,000 farmers who have grown accustomed to the tax reductions quickly perceived the review process as a regulatory one. Giving a new twist to the common governmental metaphor, state officials describe local conservation committees' enforcement role in farmland preservation as changing from the "white hats" to the "gray hats" (Telephone Interview with Dave Fodroczi, Wisconsin Department of Agriculture, Trade and Consumer Protection (Apr. 4, 1989)).

VI. Animal Waste and Agricultural Permitting Programs

The Clean Water Act, the central statute for reducing water pollution in the United States, imposes only minimal requirements on agricultural "non-point sources." The federal prescriptions that do exist arise out of the peculiar statutory definition for non-point sources. While animal feedlots and their attendant "barnyard wastes" have always been functionally classified as non-point sources, the Act classifies them as point sources. Section 402 (14) of the Act states as follows: "The term point source means any discernible, confined and discrete conveyance, including but not limited to any . . . concentrated animal feeding operation."[48]

The Environmental Protection Agency (hereinafter "EPA"), fearful of the deluge of applications that would arise from such a ubiquitous pollutant source, was initially unenthusiastic about including it within the National Pollution Discharge Elimination System (hereinafter "NPDES") permitting system. In 1977, the Natural Resources Defense Council challenged this position in the D.C. Circuit Court.[49] The environmentalists argued that the Clean Water Act had specifically cited feedlots as a point source and that the EPA administrator therefore was not authorized to exempt them from the Act's regulatory requirements. Faced with an unfavorable decision, the EPA issued regulations on June 7, 1979, that require large feedlots to obtain a permit.

The regulations affect only large operations where animals are confined for at least forty-five days a year, and they exclude operations where there is no discharge from the feedlot.[50] A sliding scale of "1000 animal units" determines eligibility according to the type of animal production. Thus, the maximum number of animals allowed on an unpermitted site at any given

48 Clean Water Act § 402(14), 33 U.S.C. § PL 92-500 (1972).

49 National Resources Defense Council, Inc. v. Castle, 568 F.2d 1369 (D.C. Cir. 1977).

50 The standard assumes capacity to hold a twenty-five year, twenty-four hour storm (40 C.F.R. § 122.42(b)(2)).

time is determined to be as follows: 1,000 beef cattle; 2,500 swine; 700 dairy cattle; 500 horses; 30,000 hens; 55,000 turkeys; or 5,000 ducks.[51] The Best Practical, Best Available, and Best Control Technology standards for feedlots in the regulations are all set at a "no discharge" level for standard weather conditions.[52] States that wish to operate their own discharge elimination permitting system are further required to promulgate regulations that prescribe the size and nature of feeding operations subject to NPDES permits.[53] The legislation in no way prevents states that choose to impose more stringent limitations upon agricultural discharges from so doing, and many have, in fact, done so.[54]

1. State Permitting of Feedlots: Criterion for Requirement to Operate with a Permit

Most states comply with the feedlot requirements set by section 122 of the EPA regulations. Nevertheless, because only relatively enormous operations are required to obtain a permit, the number of permits issued pursuant to these regulations is limited. For example, Wisconsin, perhaps the quintessential dairy state with some 80,000 milk-producing farms, has identified only thirty-one operations falling within the 1,000 animal units standard.[55] Only one of these operations contains milking cows. Moreover, the marginal utility of the federal requirements, which simply prescribe waste retention without application at an agronomically effective rate, is increasingly being criticized.[56]

51 For a comprehensive discussion on the animal waste provisions, see 2 N.E. Harl, Agricultural Law 14.02-.34 (1986).

52 In 40 C.F.R. § 412.13, an exception is made for a twenty-five year, twenty-four hour storm event.

53 10 C.F.R. § 122.23.

54 First, section 510 of the Clean Water Act sets forth a general principle recognizing the right of any state to impose limitations more stringent than federal limitations under the Act. Second, section 402(a)(1) of the Act constitutes a comparable statement vis-à-vis the scope and content of NPDES permits. The aforementioned 40 C.F.R. § 122 regulations are described as minimum requirements. Thus, the thirty-nine states that operate their own discharge permitting systems can require additional controls from those individuals whose activities generate runoff.

55 Wisconsin Dep't of Natural Resources, Animal Waste Management, 243 Natural Resource Regulations [N.R.] (July 1987); *see also* Telephone Interview with Gordon Stevenson, Wisconsin Department of Natural Resources (Aug. 21, 1987).

56 For a review of literature on rate, timing, and methods of application, see North Carolina Agric. Extension Service, *Best Management Practices for Agricultural Nonpoint Source Control*, *in* I Animal Waste 18 (North Carolina State University ed., 1982).

As a consequence of the limited effectiveness of the federal requirements, many states go beyond these requirements, both in the criteria and the scope of permit conditions. The environmental objective of these enhanced permitting programs ostensibly is to reduce nutrient and fecal coliform discharges into surface waters. A common element of these permits is the reduction of the maximum number of animals that can be confined without a permit. In Minnesota during the 1970s, the "feedlot" permitting requirements were so inclusive that farms with one horse needed to obtain a waste discharge permit. In 1980, the regulations were eased to limit the requirement to obtain a permit to feedlots with at least ten animals.[57]

Other states acted less drastically in reducing the federally mandated maximum number of unpermitted animal units.[58] However, they frequently reserve the right to subject any feedlot to permit requirements. These states also authorize EPA agricultural specialists to issue permits to any size of feedlot subsequent to on-site inspection and written notice to the feedlot operator.

The Florida Department of Environmental Regulation, when faced with the problem of eutrophication of Lake Okeechobee, developed a unique index for gauging permitting requirements in that area: the amount of animal waste runoff is directly related to the density of cattle confined in a given area. This provides a logical criterion for distinguishing between those farms that should be regulated and those that should not. Specifically, Department scientists[59] (who were summarizing data on phosphorus loadings in runoff from different land use areas involving confined cattle) concluded that a confined area should be defined as an area with a cattle density of more than five cows per acre. The final regulations included a more flexible site-specific operational definition of "High Intensity Use Area," but the overall criterion remained animal density.

The Oregon Department of Environmental Quality has departed entirely

57 Telephone Interview with Wayne Anderson, Minnesota Pollution Control Agency (Sept. 1, 1987).

58 See section 502.106 of the Illinois Live Stock Waste Regulations. *See also* Illinois Envtl. Protection Agency, Agriculture and the Water Quality Management Plan, A Midcourse Review of the Livestock Waste Management Component (Nov. 1986). Kansas regulations are outlined in Kan. Admin. Regs. 28.18.1, which specify that "any confined livestock operation which provides capacity for more than 300 head of cattle, hogs, sheep or a combination of all three . . . is subject to regulatory requirements."

59 J. Bottcher & A. Goldstein, Florida Dep't of Envt'l. Resources, Dairies: High Intensity Area, Florida Dep't of Envtl. Resources Draft Rep. (1986).

from a strict quantitative method for determining permit eligibility. Instead, any operator who has, or should have, a waste water control system must receive a permit to operate. This is largely due to the climatic variation within the state and to the acknowledgment that in the arid eastern part of the state, there is often no runoff problem. Thus, a covered chicken house where the dry manure is scraped off the floorboards would be exempt from the permit requirement regardless of its size.[60] Maryland has also made water quality the basis of mandatory permits rather than a quantitative livestock count.[61]

2. General Versus Individual Permits

The Oregon system differentiates between farmers who have already constructed storage and control facilities and farmers who have not done so, by instituting two types of permits: general and individual. Those who need to implement or construct a control measure are required to apply for an individual permit which specifically delineates the management practice to be used, and the timetable for its installment. General permits are more common, and they are issued to farms that appear likely to comply with the sweeping ban on animal wastes discharge.

The establishment of two categories of permits on the basis of potential for water pollution problems and likelihood of compliance (hereinafter "a two-tiered permit system") is not unique to Oregon. It is also the policy of animal waste programs in Kansas, Minnesota, and Pennsylvania, whose "certifications of compliance" are analogous to general permits. Further, Arizona and Florida have chosen to adopt a similar dichotomy in designing their broader permitting programs.

3. Content and Conditions of Permits

The requirements of most state-initiated animal waste permits as promulgated in various regulations can be divided into two categories: storage and application. A few states, such as Minnesota, Iowa, and North Dakota, also legislated "zoning" requirements that prohibit the operation of feedlots in close proximity to surface water bodies or within a flood plain. There is

60 Telephone Interview with Ken Ashbaker, Oregon Department of Environmental Quality (Sept. 9, 1987). *See also* the regulations issued under chapter 340-50-005 through 80 of the Oregon Administrative Rules ("Confined Animal Feeding or Holding Operations").

61 Telephone Interview with Ken McElroy, Director of Planning Analysis Unit, Office of Environmental Programs, Maryland Department of the Environment (Sept. 4, 1987).

generally a wide range of structural control measures from which conservation plan and permit writers can choose. These control measures are either drafted by the state environmental agency or by the Soil and Conservation Service (hereinafter "SCS").[62] Some states, such as Illinois, simply specify a variety of design standards for structural storage facilities, such as location of feedlot, storage capacity, and the number of storage days.[63]

The actual storage specifications in the permit are also twofold in nature. A general performance standard clause prohibiting contaminated drainage waters or other wastes from entering the waters of the state at any time is a threshold condition. Alternatively, performance standards are stipulated to control runoff based on a twenty-four hour storm event.[64] These initial conditions are supplemented by a specification of additional management practices to guarantee attainment of the objectives. These control measures may include filter strips, grass waterways, settling ponds, and, most commonly, lagoons. Frequently permits will refer to a selected manual or to a set of published guidelines rather than specifying design specifications in the body of the permit itself. For example, Pennsylvania's manure management guidebooks theoretically carry the force of law.

Two-tiered permit systems are most notable for the different degrees of specificity regarding structural control measures within permits. Thus, a typical Kansas permit will delineate the numerous parameters of a lagoon system, including de-watering and disposal activity, storage capacity, and freeboard available for future waster water storage. The less stringent "Certification of Compliance," however, simply requires control of agricultural wastes in a manner capable of preventing discharge of water pollutants into state waters. Oregon takes an alternate approach, promulgating recommended guidelines and designs that are "considered by the Department of Environmental Quality to conform to best practicable design and operational practices." General permittees must select an appropriate management practice from these guidelines.

62 *E.g.*, Kansas Dep't of Health and Env't Animal Waste Unit, Design Standards for Confined Livestock Feeding Operations (undated); U.S. Dep't of Agric. Wis., Waste Storage Structure, Technical Guide § IV (Feb. 1986).

63 Illinois Envtl. Protection Agency, *supra* note 61, app. 1.

64 *See* Kansas Permit, Preamble; Illinois Permit, IA Appendix 3; and Wisconsin Permit, Appendix 4 (on file with author). This is supplemented by a specific Best Management Practice. Examples of these permits have been reproduced in an internal report to the EPA's Regulatory Innovations Staff, "Permitting Farmers," from August 1987 (on file with author).

4. Application of Animal Wastes

Application of manure is receiving increased attention in the body of feedlot permits. Three general approaches can be identified. The first is a requirement within the permit for submission of a written manure management plan that provides for utilization of the animal waste in an environmentally acceptable manner. Wisconsin permits, for example, require that these plans include scaled maps of all fields where manure is to be spread, crop rotation schedules, the maximum allowable quantity of manure per acre consistent with crop nitrogen needs, conditions in which waste may be applied to frozen or snow-covered soil, and several other parameters.[65]

The second approach refers permittees to the relevant sections of state-promulgated guidelines and to manuals for structural control measures. The Kansas Design Standards for Confined Livestock Feeding Operations, to which state operators must conform, devotes six pages to application of manures. The guidelines emphasize application rates and adequacy of irrigation equipment. Finally, the third approach is to include application practices in the body of the permit. Individual permits in Oregon, for example, attach land application schedules to the body of the permit.

5. Procedures for Receiving and Enforcing Animal Waste Permits

When a feedlot conforms to a category that requires, by law, a permit to operate, permittees are often required to submit numerous technical documents. In Minnesota, these include a map or aerial photograph and a description of geological conditions. More common is the requirement to submit a comprehensive, written manure management plan. In some states, the permit application process essentially mirrors that of a construction license.[66] More often, feedlot permits are processed in a manner similar to

65 Wisconsin's regulatory requirements and the associated "Animal Waste Regulatory Grants" are reviewed in 1992 Division Agric. Resource Mgmt., Dep't Agric. Wis., Ann. Rep. Bureau Land & Water Resources 4–6 (1993) [hereinafter Division Agric. Resource Mgmt.].

66 For example, in the Nebraska Rules and Regulations Pertaining to Livestock Waste Control, it is stated that:

> [s]tate construction permits will be required for all existing and proposed livestock operations when livestock waste would
> 1) create a nuisance, or
> 2) violate Nebraska Water Quality Standards, or
> 3) discharge into waters of the State . . . .

other point source waste water discharge permits issued by the state agency. A proposed draft is sent to the operator, who has a set period of time (*e.g.*, thirty days) to respond. Before a permit is issued, opportunity for notice and comment is given to both the public and the permittee. In several cases, public adjudicatory hearings follow.[67]

As mentioned above, for many feedlots, determination of permit requirements is a discretionary process. On-site inspections conducted in response to a complaint generally provide the basis for these decisions. Wisconsin's permit assignment procedure is characteristic of this process. Prior to the on-site investigation, the Department of Natural Resources (hereinafter "DNR") contacts the State Department of Agriculture or the local county agent, which enables them to participate in the inspection. (Some forty counties have designated County Land Conservation Committee employees to participate in the investigations). If the inspection reveals significant amounts of manure entering surface waters or reaching groundwater, the DNR investigator sends the operation a letter (called a Notice of Discharge),[68] which is an administrative order that recommends a corrective action according to the managerial capacity or the financial capabilities of the specific operation. The farmer, assisted by local agricultural representatives or by the SCS, is required to prepare a plan for the prevention of continued degradation. Failure to submit such a plan results in the issuance of an NPDES permit that is comparable in form and style to those received by larger livestock operations.

Once the permit is issued, enforcement proceedings progress in a manner comparable to NPDES permit enforcement procedures:

1) after violations have been verified, violators receive a notice of non-compliance;
2) failure to respond results in a notice of violation; and
3) cases of continued non-compliance are referred to the Attorney General for enforcement action.

6. Sanctions for Non-Compliance by a Dairy Association

Implementation of mandatory controls on animal waste discharge does not necessarily have to be solely a governmental function. Other regional

67 Wisconsin Dep't of Natural Resources, *supra* note 55.

68 1992 Division Agric. Resource Mgmt., *supra* note 65; also Telephone Interview with Gordon Stevenson, *supra* note 55.

organizations may possess the leverage necessary to ensure environmentally sound feedlot operation. An interesting case in Oregon involved a local dairy association (Tillamook) that, in conjunction with the state Department of Environmental Quality (hereinafter "DEQ"), monitored and regulated its own operators. The 282,000 tons of manure produced annually by dairies and the Tillamook dairy association were running into the Tillamook Bay and threatening the safe harvest of shellfish.[69] Once the dairy association expressed a desire to cooperate in stopping the pollution, the DEQ's position, as glibly stated by a state official, was "[L]ook we are city slickers — you know how to farm. We'll stand back and let you solve the problem of agricultural pollution."[70]

Eventually, a dairy farm in the region did not properly eliminate runoff, despite substantial funding from a federal grant for this purpose. On the basis of complaints filed by a DEQ field representative, economic sanctions were lowered by the Tillamook dairy association that purchased the milk from the dairy farm. Accordingly, the dairy farm paid the Tillamook operator fifty cents per hundred weight of milk below the market rate. As a punitive measure, the dairy association continued to do so six months after the manure management system was correctly operated and the discharge abated.[71]

The high rate of participation of the farmers in the Tillamook Bay area has been responsible for the dramatic improvement in the quality of the Bay water. The two to tenfold decrease in fecal coliform bacteria levels in influent streams is one indicator of the extent of initial progress. Clearly, the use of sanctions contributed to the high level of participation. Sanctions by farm unions are not limited to the dairy industry. Florida's Sugar Cane League imposes rigorous requirements on its members, restricting the burning of cane in order to reduce air pollution (*e.g.*, mandating high volume air samples).[72]

69 Ass'n of State and Interstate Water Pollution Control Adm'rs, America's Clean Water, The State's Nonpoint Source Management Experience Or-5 (1985).

70 Telephone Interview with John E. Jackson, Oregon Department of Environmental Quality (Aug. 27, 1987).

71 Biological and Agric. Eng'g Dep't, N.C. State Univ., *Status of Agricultural NPS Projects 1985*, Rep. Nat'l Water Quality Educ. Project (1985).

72 Interview with Robert Buker, Vice President, U.S. Sugar Corporation, in Clewiston, Fla. (Aug. 10, 1989).

7. Achievements of Animal Waste Permits

Regardless of compliance and effectiveness of implementation, a permit system helps to identify the location of feedlots. This is a matter of no little consequence when modeling a critical watershed or zeroing in on the origins of a nutrient problem. Since the location of the feedlot may ultimately be a far more salient factor than size vis-à-vis the contribution of a given farm to degradation of surface waters, state permitting programs may make a substantial contribution to improving water quality. One advantage of animal waste programs over general agricultural programs is their long-term return. Since SCS projections regarding life-expectancies for waste retention facilities are typically set at twenty-five years, once installed, these capital intensive control measures tend to operate smoothly.

State initiatives in the area of feedlot permitting are indicative of local willingness to begin the formidable task of regulating large (and often politically powerful) agricultural operations. The administrative infrastructure and personnel that are currently directed at feedlots may, with time, be redirected to confront the larger issue of sediment, nutrient, and pesticide runoff from fields. Further, although the contents of a permit that requires animal waste management practices are completely different from the contents of a permit that requires field crop control measures, the form need not differ significantly. Just as SCS contracts for field and livestock controls often differ only in their reference to the official conservation practice catalog, so might a permit requiring sediment control resemble an animal waste permit.

8. Differences Between Animal Waste Permits and Other Agricultural Permits

The ease with which many states have implemented enhanced animal waste discharge permitting schemes should not be regarded as a guarantee for the successful institution of other agricultural permitting programs. Fundamental differences exist between cropland non-point source controls and feedlot control measures. Farmers are relatively willing to implement controls for manure management for several reasons, most notably, the tremendous amount of time that can be saved by a lagoon storage system. Prior to the installation of some manure storage measures in confined feeding operations, application of manure was a daily business that could take as long as three to five hours. With a properly designed lagoon, application is typically done on an annual or biannual basis. Not only is this

more efficient in terms of the scheduling convenience of the farmer, but also in terms of meeting the assimilative capacity of the land.

Moreover, with the rise in fertilizer costs, effective management and application of manure can contribute to substantial savings. A small farm, which typically used 500 pounds per acre of "10,10,10" fertilizer annually, can save as much as $1,500 by using animal wastes efficiently.[73] In practice today, almost all new feedlots are designed to include some form of a waste water control system.

Beyond these built-in incentives for farmer participation, the efficacy of a complaint-response system is probably far greater with animal waste discharges than with other agricultural runoff. The visibility of manure in surface waters not only facilitates complaints, but also makes tracing the origins of a discharge much easier. The intrinsically distasteful nature of excrement in surface waters also aids state environmental agencies to overcome some of the political obstacles to promulgating and enforcing enhanced regulations.[74] The fact that the runoff from confined feeding operations is often in the form of a discrete conveyance also makes permits easier to impose.

VII. Agricultural Controls for Field Crops

The variety of runoff problems from different field crops, as well as climatic and topographical conditions, makes generalization about pollution control of field crop activities inherently problematic. Nevertheless, the records of regulatory initiatives are sufficiently impressive and instructive to justify an assessment of specific programs. This section will begin with a description of two of the best-documented and most successful of such regulatory initiatives: the Nebraska groundwater program[75] and the Florida permitting

73 Interview with Michael Washington, District Conservationist, in Orange County, North Carolina (July 7, 1987).

74 Telephone Interview with Lynn R. Shuyler, Chesapeake Bay Liaison Office (Aug. 26, 1987).

75 *See* M. Link, *Ground Water Nonpoint Source Management in Nebraska*, 23 Comm. Soil Sci. & Plant Analysis 2135 (1992).

program,[76] although programs in Arizona[77] and Pennsylvania[78] are equally deserving of attention. The Nebraska program is an example of a general regulatory requirement for an agricultural population, while Florida has a more site-specific permitting approach. Specific conclusions from these programs will be offered, with focus on enforcement.

1. Nebraska's Natural Resource District Groundwater Program

In 1972 Nebraska established a network of Natural Resources Districts (hereinafter "NRDs"), which replaced the existing conservation districts within the state.[79] These multi-county districts, twenty-three in number, are

76 In the most comprehensive study on the subject to date, a quantitative time-series analysis of state agricultural pollution programs revealed the South Florida program to be the most successful state intervention program for changing farmer activities and inducing implementation of control measures; *see* A. Rosenthal, *State Agricultural Pollution Regulation — A Quantitative Analysis*, 1990 Water Env't & Tech. 50.

77 See generally Arizona Regulations R18-9-202 ("Water Pollution Control") and, specifically, article 2 ("General Permits"), from 1989. The primary goal of the Arizona permitting program is reduction of groundwater pollution. Rather than tailoring its permits to the individual conditions of specific farm operations, the law assigns a general permit to all farm operations "by rule." An Arizona statute (Environmental Quality Act, Ariz. Rev. Stat. Ann. § 49-221 (1986)) requires the Director of the Department of Environmental Quality (DEQ) to specifically grant general permits for agriculture. These general permits apply to all persons engaged in the application of nitrogen fertilizers and animal feeding operations. The general permits set forth a series of environmental objectives that are generically entitled BMPs. These include activities designed to:

1) Limit the amount of nitrogen fertilizer applied to meet projected crop needs;
2) Time applications to coincide with periods of maximum plant uptake;
3) Place applications to deliver nitrogen to the area of maximum plant uptake;
4) Limit the amount of irrigation water to minimize leaching and runoff;
5) Time irrigation to minimize leaching and runoff; and
6) Utilize tillage practices that maximize nitrogen and water uptake.

Arizona Dep't of Envtl. Quality, Best Management Practices Handbook for Regulated Agricultural Activities (Draft) 1–3 (1989).

78 Pennsylvania's sediment control program (promulgated pursuant to the Clean Streams Law, 1987 Pa. Laws 394) constitutes a completely different model, relying on local enforcement. When the Clean Streams Law was first enacted, the Department of Environmental Resources alone held the powers to inspect and enforce the Earth Disturbance Permits required of all landowners. Only after the Law was rendered ineffective due to the state's inadequate manpower were locally run Conservation Districts (established under Pennsylvania Conservation District Act, 1945 Pa. Laws 217) offered the option of assuming full regulatory authority.

79 *See* Neb. Rev. Stat. §§ 2-1502, 2-3203, art. 32 (1977).

autonomous political divisions of state government[80] and are comparable in concept to the Union of Cities in Israel. NRD boundaries are set along watershed lines in the eastern part of the state, often splintering counties into several districts. As the title to this section indicates, the breadth of the district authorities is quite wide. They oversee a range of environmental and natural areas that include soil conservation, water conservation and management, and groundwater protection.[81] In the present context, they serve as the operational unit for a series of regulatory measures by the state.[82]

The policy orientation with regard to groundwater pollution caused by agricultural activity varies amongst NRDs, but the activities of some serve to demonstrate the potential of "regulations" for changing farmer activities. The Nebraska Groundwater Management and Protection Act, amended in 1986, is one of the most aggressive statutes in the United States designed for comprehensive protection of groundwater.[83] The Act authorizes the designation of "control areas" in which regulatory requirements will be imposed on landowners if an area aquifer is deemed to face threatening conditions.[84] This can be due to a danger of contamination or of de-watering through over-pumping to a level inadequate to sustain water supply.

Although the Act empowers the Nebraska State Department of Environmental Quality to oversee the Act, NRDs are involved extensively in implementation.[85] Central Platte was the first NRD to utilize its authority under

80 According to the literature of the Nebraska Association of Resources Districts, NRDs were established as a result of frustration with federal and state-level attempts to manage these resources and due to "Nebraska's renewed awareness coupled with citizen's desire for local governmental independence." *Natural Resources Districts, A Grassroots Approach to Conservation*, 1988 Nebraskaland Mag. 1. District officials describe the present arrangement as a vast improvement over the previous situation, which was characterized by inefficiency and turf battles between a myriad of different agencies responsible for different aspects of natural resource management. Interview with Steven Oltmans, Papio, Missouri River Natural Resources District (Mar. 28, 1989).

81 In addition, included are solid waste disposal, forestry, flood control programs, recreation and park land development, fish, and wildlife.

82 *See generally* M. Link, Mandatory Agricultural Practices in Nebraska, Nonpoint Source Pollution, Causes, Consequences and Cures, Proceedings (1993).

83 Neb. Rev. Stat. § 46-656 (1986).

84 An excellent synopsis of the Act can be found in J.R. Seyfer & D. Ehrman, Nebraska Nonpoint Source Management Plan (1988) (the authors are from the Water Quality Division, of the Nebraska Department of Environmental Control); *see also* R. Ehrman *et al.*, *Special Protection Areas: A New Nonpoint Source Management Option in Nebraska*, 46 J. Soil & Water Conservation 263 (1990).

85 For example, NRDs must develop a Ground Water Management Plan for "the protection and sustainment of the groundwater reserves." In addition they are empowered to: (1) adopt and promulgate rules and regulations necessary to fulfill the Act; (2) require reports from groundwater users as necessary; (3) conduct investigations in areas related to groundwater quality; and (4) issue cease and desist orders to any individuals contemplating the entry of contamination into groundwater supplies. For the most recent update on the program's progress, *see* 1992 Neb. Dep't Envtl. Quality Ann. Rep., Special Protection Area Program, May 1993.

the Act to regulate agricultural pollution of groundwater, and its activities serve as a model in this regard. The District's initiative was in direct response to the severity of the contamination in the groundwater, where nitrate levels exceeded the permissible standard (MCLG) under the Safe Drinking Water Act of ten milligrams per liter (the chemical equivalent of the Israeli forty-five milligrams per liter standard) in over 440,000 acres of the district.[86] By 1977 hydrological studies had demonstrated fairly conclusively that the contamination was due to nitrate fertilizers.[87]

The District had attempted several demonstration projects and advocated a policy of voluntarism until 1984. Following the 1986 amendments authorizing the state to intervene and take action if NRD activity was found to be inadequate, the District Board approved a comprehensive regulatory program as follows:

1) The District is divided into three "Phase" areas, according to the concentrations of nitrates in the groundwater. Phase I areas are those where nitrate-nitrogen levels in the underlying aquifer are between 0 and 12.6 ppm. Phase II areas have levels ranging between 12.6 and 20 ppm, and Phase III areas exceed levels of 20 ppm.[88]

2) In Phase I areas, there is a ban on fall and winter (pre-March 1) applications of commercial nitrogen on sandy soils. Phase II areas go beyond this requirement, with a ban on all fall and winter applications, unless they are combined with an NRD-approved inhibitor.[89]

86 3(6) Central Platte Nat. Resources District Newsl., June 1987, at 2. Unique circumstances combined to create this problem. The District is highly agricultural and, with 14,000 irrigation wells, boasts the highest concentration of nitrates in the world. Yet it lies on sandy soils with a relatively shallow aquifer. By 1973 a 300,000 acre stretch showed concentrations of nitrate of over eleven ppm.

87 Interview with Milt Moravek, Central Platte NRD Projects Director (Mar. 27, 1989).

88 Rules and Regulations for the Implementation of the Nebraska Groundwater Management and Protection Act (Central Platte Natural Resources Dist.), July 23, 1987, Rules 1–35.

89 Most nitrogen applied on the District lands is in the gaseous form of ammonia. Liquid

3) All farmers using fertilizers must attend and be certified by NRD-sponsored educational classes.[90]

4) Finally, annual soil and water testing for residual nitrates is required, and the results must be submitted to the NRDs. While to date, no Phase III area has been established, the first group of groundwater monitoring reports suggested that one would soon be. Phase III requirements include all of those imposed on Phase I and II, but the ban on fertilization prior to March 1 is unconditional, adding mandatory split applications of fertilizers[91] and whatever additional measures are required to reduce concentrations.

The first several years of the program were declared a resounding success from a regulatory point of view. Compliance was extremely high, estimated by overseeing officials at ninety-five percent of the farm population.[92] The existence of health effects and of actual cases of methemoglobinemia in infants appears to have played a role in the willingness of the farmers to comply with the strict regulations promulgated in Central Platte. Yet reports seem to indicate that the severity of the problem is far greater than originally

ammonia is also applied with knife plowing, injected to a depth of six to eight inches. Once applied, the ammonia is transformed by bacteria into nitrate, the more leachable form of nitrogen. The inhibitor, basically a fungicide, works by temporarily killing the converting bacteria. This extends the interval during which the fertilizer is in its gaseous or liquid form, during which time it can be utilized by the plants or become airborne.

90 Insofar as the key to the success of an agricultural program is to convince landowners that there is both a serious problem and an available solution, some districts have utilized regulatory powers to ensure that all farmers receive the necessary training regarding a specific problem. Central Platte, Nebraska, made education the centerpiece of its regulatory requirements. Farmers located in regions of the District with high groundwater nitrate concentrations are required to attend a class in fertilizer application and nutrient management every four years. Within two years after the rule had come into force, a remarkable ninety-nine percent had attended classes. While some locals joke that farmers are often caught dozing off in class, the local farmers acknowledge that the two-hour sessions have been effective in transmitting the gravity of the groundwater contamination situation. They also note the economic benefits inherent to reduced fertilizer applications. *See* A. Rosenthal, The Utilization of Conservation Districts in NPS Regulatory Programs, presented at the National Nonpoint Source Conference, St. Louis, Missouri (Apr. 25, 1989).

91 Synchronization with the uptake by the vegetation is also the underlying logic behind the prohibition on applications during certain months, and when temperatures drop below fifty degrees fahrenheit.

92 M. Link, *Ground Water Nonpoint Source Management in Nebraska*, 23 Comm. Soil Sci. & Plant Analysis 2135-50 (1992). Water sampling reports were submitted for 4,025 of the 4,200 wells in the Phase II area (ninety-six percent).

expected. Average concentrations in irrigation well tests that were conducted in the Phase II area were stabilized at roughly 18.94 ppm.[93] As is often the case with groundwater protection programs, it may take several years for the results of the regulations to be manifested in improved water quality.

2. Florida's Permitting Program

In 1984, the Florida legislature passed the Warren S. Henderson Wetlands Protection Act,[94] which included an "agricultural exemption." This exemption limited the Florida Department of Environmental Regulation's regulatory authority over agriculture to activities that affect groundwater quality. Authority to protect surface waters was transferred to Florida's five water management districts.[95] The exemption ostensibly was enacted to protect agriculture from government regulation.[96] Ironically, water management districts took this as a signal to begin toughening their controls on agriculture to include not only water quantity, as in the past, but also water quality.[97]

The five water management districts exhibit varying degrees of aggressiveness in attacking agricultural problems, with the South Florida Water Management District and St. Johns River Water Management District[98] taking a particularly aggressive approach to the pollution issue. The primary tool developed during the 1980s by districts to control agricultural runoff into surface waters is Management and Storage of Surface Water (hereinafter "MSSW") permits. These supplement an existing system of "Consumptive Use Permits," which budget water allocations and protect against flood

93 Central Platte Natural Resources Dist., Final Report for Groundwater Quality Management (1989) (internal document).

94 Fla. Stat. Ann. § 403.927 (West 1985).

95 For a description of the breakdown of the legal authorities of Florida's water management institutions, *see* J.A. Jurgens, *Agricultural Nonpoint Source Pollution: A Proposed Strategy to Regulate Adverse Impacts*, 2 J. Land Use & Envt'l L. 195, 204 (1986).

96 Telephone Interview with John Cox, Florida DER (Oct. 8, 1988).

97 In a recent court decision by the 10th Circuit Court, Polk County struck down a polluting operation argument that "the agricultural exemption applied to the defendant's property" and upheld the enforcement action by the South Florida Water Management District; *see* SWFWMD v. Waibel, GC-G-90-1341 (10th Cir. Polk County Aug. 31, 1992) (on file with author). For a broad overview of the subject, *see generally* Fla. Bar Ann. Envtl. and Land Use Law Update (Conference Proceedings) at ch. 4 (1993) ("Water Management Districts").

98 The border that divides the two districts appropriately runs right through the metropolitan area of Orlando, Florida, as dictated by the drainage patterns of the regional watersheds.

control (*e.g.*, Consumptive Use Permits require that agricultural operations control runoff from a twenty-five year rainfall event). MSSW permits, however, are primarily driven by environmental considerations.[99] Modeling determines the maximum load allocations to area surface waters and wetlands, and design standards for structural control measures are assigned accordingly.

Existing operations are not required to obtain an MSSW permit, but all new and modified operations over forty acres in size must apply for one. Operations occupying less than forty acres of land are eligible for a "general permit" that is less detailed and requires less documentation in the application. Since agriculture in many regions of Florida has undergone tremendous changes over the last ten years, permitting has become ubiquitous in some rural areas of the state. Several thousand permits have been issued since 1985. On April 2, 1993, the Florida legislature passed a major statutory revision of environmental institutions[100] that was intended to expedite further "streamlining of the permitting process."

While MSSW permits allow for a certain amount of flexibility in terms of the preferences of individual operators and in terms of the characteristics of their crops and lands, the orientation of the districts is well defined. Originally MSSW permits allowed for three different control measures to abate runoff: (1) wet detention systems (sedimentation ponds); (2) dry detention; and (3) retention, which holds the water and allows for evaporation and percolation. Increasingly, supplementary management practices are finding their way into MSSW permits, and the districts pursue a broad range of environmental goals via the permits. Nevertheless, the underlying water quality orientation remains committed to retention or "treatment" of waters draining off agricultural lands in order to reduce the direct discharge of nutrients into sensitive receiving waters.

The MSSW permit application process is designed so that the onus of demonstrating the effectiveness of a project or operation falls on permittees. Applications must include a range of aerial photographs, engineering specifications, environmental data, and calculations that enable the limited agency personnel to review permits within a reasonable time-frame. In order to ensure the quality of the data and the reliability of the design of the management practice, external engineering professionals are utilized extensively.

99 Telephone Interview with John Cox, *supra* note 96.
100 1993 Fla. Laws chs. 93-213.

The participation of consulting engineers in the permitting process, however, raises application costs substantially for permittees and is politically unpopular. When farm operations are small, the local Soil Conservation Service extension personnel plays an important role in assuring the quality of plans. While technically, a district board of directors officially "approves" permit conditions, this typically is a mere rubber-stamping of the technical decisions made by the district engineering staff.

Implementation of the MSSW permitting programs, like most environmental regulation, is expensive. Apart from the cost of employing highly skilled personnel, monitoring and enforcement activities require aerial surveillance, laboratory skills, and special vehicles. While permit programs levy application fees of varying amounts, they do not cover the expenses of running an agricultural permitting system.[101]

VIII. The Form of Agricultural Regulation: Design Versus Performance Standards

Whether a regulatory program involves individualized permits, as in Florida, or water quality based general standards for operation, as in Nebraska, the actual form of mandated requirements can vary. The manner in which these requirements are formulated may determine the enforcement approach and success no less than the substantive content of the requirements.

Environmental regulatory systems are typically divided into two general categories: those driven by technology based discharge standards and those guided by ambient based environmental quality standards.[102] Because of the difficulty involved in linking stream and groundwater quality to specific agricultural discharges, command and control systems for agricultural (or voluntary ones for that matter) generally will entail technology based discharge standards, at least in the foreseeable future. Technology based standards may be expressed as either performance or design standards. A

101 For example, a proposal to raise permit application fees from the previous rate of $350 for a MSSW permit to $1,000 was approved by the St. Johns River Board, although an in-house economic assessment concluded that the revenues created by the new fee would constitute only half of 1976 costs. Interview with Harold A. Wilkening, III, P.E. Chief Engineer, St. Johns River Water Management District (Aug. 11, 1988).
102 Congressional Budget Office, Environmental Regulation and Economic Efficiency 19 (Mar. 1985).

performance standard allows a source considerable latitude in employing control technologies as long as it does not exceed a specific discharge limit. In contrast, a design (or engineering) standard requires the use of a particular technology or practice without specifying a maximum quantity of a pollutant that can be discharged.

This distinction raises one of the fundamental technical questions regarding the composition of agricultural permits. In practice, programs designed to abate non-point runoff (including those regulating urban runoff) primarily have taken a "design standard" approach. A brief evaluation of this dichotomy and of the prevailing preference for design standards offers important insights into the enforcement perspective and demands in the agricultural context.

IX. Performance Standards

1. Effluent Limitations as Performance Standards

Performance standards for point sources constitute the basic model for water regulation in most countries.[103] These standards take the form of technology based and water quality based effluent limitations. The standards themselves are typically expressed in specific time-associated quantities (*e.g.*, 150 pounds per day) or in concentrations (0.5 milligrams per liter) that reflect the amount of pollution reduction considered to be technologically and economically feasible for a given industry. Although generally based on the demonstrated performance of an appropriate technology, effluent limitations do not mandate a specific type of control system. Rather, they shift the burden to the discharger, allowing the industry or sewage treatment plant to install any technology that meets the desirable levels of control.[104]

This approach is facilitated by the physical characteristics of point source discharges. In general, an industrial source or sewage treatment plant has an

103 In the Israeli context, present effluent standards are found in the Model bylaw, *see* p. 0–24, for Local Authorities (The Discharge of Industrial Wastes into the Sewage System), 1981, *translated in* Israel's Environmental Legislation, at D-24 (S. Warchaizer ed., 1993). In 1992, a new performance standard for municipal sewage plants went into effect in Israel Public Health Regulations (Determination of Waste Water Standards), 5440 K.T. 1033 (1992)(Isr.) to twenty milligrams per liter BOD and thirty milligrams per liter suspended solids.

104 *See* Rogers, Environmental Law (1988).

outfall that comes from a controlled process. Effluent flow can be adjusted, and the discrete and finite number of discharge locations allows for elaborate self-monitoring schemes.[105] Notwithstanding the apparent simplicity, the number of reported and unreported violations of effluent limitations is enormous.[106]

In contrast, existing agricultural permitting systems have chosen, with only a few notable exceptions, to base permit conditions on "design standards" rather than on the traditional performance standards. There are several reasons for this preference: (1) the inherent difficulties of applying performance standards to control measures whose effectiveness is largely determined by stochastic variables such as intensity and inter-event frequency of rainfall; (2) the easing of the burden of monitoring and enforcement activities; (3) the reduction of confusion and enhancement of implementation of permit conditions by the permittee; and (4) the avoidance of the expense of laboratory facilities and inadequate precision of field analytical techniques.

A brief examination of each factor reveals the formidable logistic advantages of design standards, particularly with regard to enforcement.

a) Incorporating Stochastic Elements into Performance Standards

The extent of agricultural pollution is directly related to the level of precipitation within a given watershed. Unlike point sources, which involve relatively constant, low flow events, the episodic nature of agricultural pollution hampers precise prediction prior to installation of the efficiency of control measures. Information regarding the annual or even seasonal rainfall patterns alone may do little to enlighten regarding ultimate management practice effectiveness. For instance, inter-event or storm frequency, generally a poorly documented parameter, is often cited as having a major impact on retention basin effectiveness.[107] Moreover, the energy from rainfall and

105 A report for the EPA by the Research Triangle Institute estimated that the 822,000 Discharge Monitoring Reports take 12.6 million person hours to review and leave many violations unanswered; B.J. McCrodden & R.C. Nichols. Review of Monitoring Requirements in NPDES Permits, and the Discharge Monitoring Report (Mar. 1987).

106 Office of Water, U.S. Envtl. Protection Agency, Methodology for Analysis of Detention Basins for Control of Urban Runoff Quality 5-12 (1986). Effective basin volume is typically given as the average interval between storms (hours) multiplied by the rate at which a basin empties volume runoff from mean storm in cubic feet.

107 *See* U.S. Dep't of Agric., Raleigh, N.C., The Universal Soil Loss Equation 4 (1981).

flowing water, the forces that tend to create in-stream sediment problems, vary tremendously.[108]

Even if rainfall were constant, the extent and type of pollutants that a management practice must reduce could be highly variable. For example, factors such as increased cultivation, construction activities, or livestock concentrations upstream from a management practice can change the composition of the pollution stream or temporarily overwhelm the assimilative capacity of a given practice. Events that are beyond the control of permittees often dominate agricultural pollutant concentrations. For example, even carefully managed agricultural chemical and fertilizer usage applied just prior to a rainfall event may result in off-site pollutant discharge. Soil infiltration rates and permeability are subject to seasonal variations, as well as to random fluctuations due to antecedent conditions.

In short, the initial drawback of establishing a performance standard for a critical agricultural parameter (*e.g.*, phosphorus or sediment) is related to the random nature of the causal non-point source factors. The design of a management practice to meet the pollution control standard under the full range of precipitation conditions may require a margin of safety so wide so as to render the practice prohibitively expensive or, alternatively, legally indefensible.

b) Easing the Burden of Monitoring and Enforcement Activities

In order for permits incorporating performance standards to be meaningful, a virtual army of professionals supported by extensive laboratory facilities is necessary. The ongoing burden of monitoring for both permittee and the oversight agency may offset any savings derived from the less expensive practices selected. Moreover, because most programs involve self-monitoring (*.e.g.*, the Clean Water Act's Discharge Monitoring Reports), quality assurance plans should be required, which complicates compliance even further.

In contrast, design standards offer relative simplicity for perennially understaffed monitoring and enforcement divisions. For example, under the Pennsylvania Clean Streams Act, the Sediment and Erosion Plan, which serves as the substantive basis for earth disturbance permits, specifies sediment control activities that landowners must undertake. Failure to implement a plan subjects them to daily fines of up to ten thousand dollars. A photograph taken and documented by state or conservation district inspectors, when matched with the blueprints of the Sediment and Erosion Plan, provides sufficient evidence on which to base civil and criminal penalties. This process offers a much needed enforcement tool for state and conservation district inspectors who have neither the facilities nor the support staff to back up site inspections with laboratory analyses.

Typically, environmental agencies have not had at their disposal adequate personnel and resources for establishing a performance based permitting system for non-point sources. In Israel, where environmental inspectors are not trained in chemistry and where any available laboratory facilities are run by Ministry of Agriculture personnel who are opposed to a regulatory role, such requirements might ultimately lead to a situation where information would be gathered but not analyzed and applied, which would undermine the credibility of the entire program.[109]

c) Reducing Permittee Confusion and Anxiety

As mentioned above, the cause of unusually high agricultural pollution loads can often be traced to factors beyond the control of a given landowner. For example, upstream discharges or low flow in receiving waters can render conscientious implementation of control measures inadequate. Moreover, landowners often are not directly involved in the actual design of the agricultural reduction program. Many farmers resent this reliance on engineers. If permittees are to participate in maintenance schemes, nonetheless, it is important that these schemes entail simplified conditions based on design standards developed by engineers.

Aware of the stochastic and uncertain properties of precipitation and drainage, professional engineers typically design systems that provide for probabilistic events. Engineers prefer to design for "average" rather than peak conditions. They also tend to seek approval from the regulatory agency for the actual control measures designed, thereby protecting themselves against possible "exceedances" in cases of extreme storm events. As a result, performance standards are functionally transformed into design standards. As Earl Shaver, Director of the Delaware Stormwater and Sediment Control Program, explains, "[If] you tell a consultant you need x level of removal,

108 "You need to have responsible professionals who can handle the information and do something with it. If you're requiring it and then not looking at it, then you're defeating the purpose of the performance system." Interview with Michael G. Cullum, Director of Research, South Florida Water Management District (Aug. 8, 1988).

109 Interview with Earl Shaver, Maryland Department of Natural Resources (Sept. 4, 1988).

the first thing they do is ask you how to do it. So it comes back to you anyway, and ultimately you have to make a judgment on the design standards."[110]

In many cases, regulated farmers seek only "peace of mind," namely, the assurance that they have complied with the requirements of the law. In such cases, both developers and farmers may prefer to simply finance the necessary structural measures and not be bothered with the nuisance of finding the single most effective practice, given the allowable discharge limits. One could argue that operation and maintenance will always be an integral part of the implementation of any practice and that a performance standard contains an implied "O&M" (operational and maintenance) provision, yet design standards can include clear directions for maintenance of a facility, including schedules for dredging and cleaning of outflow pores. Certainly, the chemical analysis required to maintain a performance standard is more bothersome than most descriptive maintenance provisions.[111]

In cases where permit conditions contain nonstructural requirements, a performance standard would seem to be even less appropriate. For example, any estimate of an acceptable runoff from each field where conservation tillage is utilized on the contour would be imprecise and an overwhelming task. Since the effectiveness of a management practice generally is demonstrated by percentage reduction in a pollutant loading (*e.g.*, sediment or nutrients), a performance standard would require accurate estimates of background concentrations in runoff. In other words, extensive water quality monitoring prior to installation of a system is necessary to ascertain the success of the practices in use under a range of conditions. Due to the variation in the types of soils and land use activities, it would be extremely difficult to establish standardized monitoring to assess "pre-installation"

110 The position was summed up in an administrative hearing in Bucks County, Pennsylvania. A contractor was charged with violation of the Clean Streams Law for failing to conform to the conditions of his erosion and sedimentation plan. In his defense, the contractor argued that installation of the BMP would have had little or no effect on the loadings caused by the intensity of recent storm events. In delivering the guilty verdict, Conservation Chairman Jim Gemmell explained the essence of the design standard's advantage: "If you had installed the berm, and then this thing had happened then shame on the engineers and shame on us." *Enforcement Hearing*, Bucks County Conservation Dist., Aug. 19, 1988.

111 This can be seen in the "muck farms" of southern Florida with their high nitrate concentrations. These lands came into production due to reclamation and draining activities that were sponsored and designed by government agencies. It is, therefore, difficult to point to a natural "background level" against which to compare.

runoff concentrations.[112] By simply requiring that farmers implement specific irrigation and fertilization practices, a state like Arizona not only makes life simple for its regulators, but also for its farmers.[113]

Although specifying where and when (*i.e.*, under which storm and weather conditions) monitoring should take place is difficult, verifying that the monitoring conditions have been met is even more problematic. Data suggest that even in the absence of any development, background pollutant loadings exceed the allowable level for water quality standards more frequently than previously imagined.[114]

d) Analytical Limitations

Despite the ostensible appeal of chemical and biological parameters as performance standards within permits, it may be some time before simplified methods for accurate chemical analysis are available. To begin with, on-site colormetric assays for phosphoric and nitrogenous compounds are not yet precise enough to receive EPA approval. For example, the Hach Company, a major producer of such "field kits," has packaged methods that can accurately detect nitrate levels to within 0.02 milligrams per liter, and phosphorus levels have a level of detection set at 0.1 milligrams per liter.[115] Since a typical water quality regulation sets a ceiling for phosphorus at 0.2 milligrams per liter,[116] the existing field kits may not be helpful in assessing the small, but critical, fluctuations in phosphorous concentrations.

Indeed, field monitoring kits can uncover gross violations of a water quality standard, yet additional laboratory analysis involving spectrophotometric readings is necessary before a verifiable violation can be documented. Field kits are substantially less expensive than laboratory analyses. For example, an NI-14 kit for analysis of nitrates costs $44.75 and contains reagents sufficient for fifty separate samples. This compares very favorably with laboratory testing of water samples where, typically, chemical analysis costs $10 to $15 per parameter.[117] Hence, as the accuracy and precision of

112 *See supra* note 77.

113 *See* L. Gianessi *et al.*, Nonpoint Source Pollution Policy: Are Cropland Controls the Answer? (Resources for the Future) (1986) (prepared for the EPA, S.C.S., and U.S.G.S.).

114 *See Products for Analysis*, 1988 Hach Co. Catalogue 80, 81.

115 *See* Gianessi *et al.*, *supra* note 113.

116 Interview with John Sheets, Director of Analytical Laboratories, North Carolina Department of Public Health (Jan. 11, 1988).

117 Interview with David Unseld, South Florida Water Management District (Aug. 8, 1988).

these field analysis techniques improve, it is likely that the feasibility of performance standards for agricultural controls will also improve.

However, even if the analytical constraints can be overcome, the classic numeric chemical units traditionally used as effluent standards may be scientifically inappropriate. For instance, dissolved oxygen levels often drop to undetectable low levels in many Florida waters without damaging indigenous fish populations.[118] As a result of bioaccumulation, conventional pesticide thresholds may understate the risks to higher links in the aquatic food chain.

In general, there is increasing recognition of the fact that meaningful agricultural water quality standards should be different from the existing numeric chemical ones. For example, the build-up of pollutants such as phosphorus in the sediment may become the most important single factor for ambient water quality at any given point. The St. Johns River Water Management District launched an ambitious program of sediment analysis and the correlation with water quality in Lake Apopka, which may lead to modifications in District permits within the area.[119]

Additionally, the task of gathering data to run watershed models that characterize site-specific pathways for discharged pollutants currently exceeds the capabilities of most environmental agencies. Presumably, a simplified series of analytical measures, more appropriate for agricultural pollution, would ease this burden to some degree. Unfortunately, there is little to indicate that there will be such a development in detection methodology in the foreseeable future.[120]

2. The Case for and Against Performance Standards

There are several reasons why performance standards are theoretically preferable for agricultural permitting. First, advocates are quick to cite the crucial importance of linking implementation with actual water quality. By their very nature, performance standards offer the advantage of a more

118 Interview with Harold Wilkening, III, *supra* note 101.

119 Heidelburg College in Tiffin, Ohio, has the only research laboratory in the United States that is involved on a full-time basis in developing appropriate analytical and monitoring techniques for agricultural contamination. Interview with David Baker, Director, Water Quality Laboratories, Heidelburg College, Tiffin, Ohio (Aug. 29, 1989).

120 Basis of Review for Surface Water Management Permit Applications within the South Florida Water Management District, Apr. 1987, *reprinted in* 4 Permit Information Manual § 1.3 (1988) [hereinafter Basis of Review].

obvious and simple explanation for imposing a management practice. Because the link with water quality is generally self-evident, performance standards also provide an easier way of "ratcheting" controls up or down in response to the actual water quality of a targeted water body. Regulators need only increase or decrease the allowable discharge concentration levels.

Second, some argue that performance standards allow for greater innovation. Setting overall discharge rates enables landowners to experiment and to arrive at more cost-effective control measures. The potential for innovation, however, may be considerably lower in the agricultural context than in the context of point sources. In most regions, small operators do not have the resources to develop new and innovative management practices. Demonstration of management practice effectiveness is difficult, and ultimately, in the absence of a "paired" location, it may be impossible.

Farmers tend to be averse to the risk involved in attempting new runoff controls. A management practice that affects production activities might be perceived as a threat to crop yields. Failure of an innovative practice could damage production or trigger costly sanctions. In light of the small profit margin that is characteristic of so many farms in America today, there is little room for error. Moreover, there is already an extensive menu of control measures from which to choose. Permitting agencies need not impose a uniform technology, but instead, can simply require the applicant to specify the physical characteristics of the management practice selected within the permit. By so doing, much of the feared economic inefficiency associated with blanket requirements to implement a given practice can be avoided.

a) Performance Standards for Agriculture: The Potential

South Florida Water Management District has given official endorsement to the concept of performance standards in its basis for review of regulations. The general policy is set forth as follows: "The criteria contained herein are flexible with the primary goal being to meet District water resource objectives. Performance criteria are used where possible."[121]

As mentioned, in practice, the District primarily writes permits with tight design criteria for the structural measures and other required control measures. But the specifications in Management and Storage of Surface Water permits are driven by site-specific water quality goals and probabilistic

121 Interview with Steve Anderson, Natural Resource Management Division, South Florida Water Management District (Aug. 8, 1988).

estimates of performance. As one District engineer explained, "[I]n issuing a permit, we want the discharge off-site to meet our state water quality standards (BOD, DO, turbidity, etc.). What we're looking at is eutrophication and aesthetics."[122] When performance standards can be employed, the South Florida District does so. Turbidity offers an interesting example of how a performance standard might work within an agricultural control scheme.

b) Turbidity: A Generic Performance Standard

An exception to the reliance on design standards for agricultural controls is the Florida enforcement of a performance standard that stipulates the allowable turbidity of waters discharged from land use activities. Although not actually incorporated into permits, utilization of a state-wide water quality standard demonstrates how a performance standard in a permit could be enforced.[123] The contents of the suspended particles are typically measured in terms of Nephelometric Turbidity Units (hereinafter "NTUs"). Turbidity, which is caused by sediment loadings, usually arises as a water quality problem during the construction or earth-moving phases of a project.

Florida State Water Quality Regulations mandate that "turbidity shall not exceed 29 NTUs above natural background." Thus, the performance standard is not absolute, but involves a comparison with an identifiable background level. A sample is taken upstream from the suspected violation site or in an area unaffected by turbidity. The availability of portable battery-powered nephelometers allows for on-site assessments of the existence and extent of a violation.[124]

The unique aspects of turbidity that make it a water quality parameter amenable to a performance standard highlight the reasons for the tendency to use design standards for agricultural permits. First, turbidity is basically a visibility standard that is designed to protect aesthetic qualities of water. Violators more readily comply with "stop work orders" because violations are visible both to dischargers and to monitoring personnel. In fact, most exceedances of the standard are gross enough to be sighted by aerial monitoring activities. Furthermore, verbal "stop work orders" are more readily complied with, as violations are eminently discernible and no "active" remedial action is required.

122 Turbidity is defined as "cloudy, discolored or muddy water created by suspended particles." *Turbidity Program Procedures*, *in* South Fla. Water Management Dist. Procedures Manual 1 (1988).

123 Interview with David Unseld, *supra* note 117.

124 *See* Congressional Budget Office, *supra* note 102, at 19.

Second, ready access to accurate analytical technology makes turbidity a parameter that is easily (and immediately) demonstrated in an administrative or legal proceeding. Finally, human activities (*e.g.*, construction and earth moving) generally are responsible for the problem. In most cases, the agricultural pollution episode can be ameliorated by cessation of the activity. All these factors make injunctions an obvious legal remedy. Regulators cannot expect courts to grant prescriptive rulings, which require active (and potentially costly) installations and lengthy chemical analyses.

X. Making Design Standards Operational

1. The Role of Water Quality in Permit Conditions

Chief among the challenges to a "mass produced" permit system is integration of actual water quality conditions into the system's design standards. Such standards are often set without adequate regard for the specific ambient water quality affected by the permittee's activities. It is, undoubtedly, an easier task to impose identical technologies on an entire population of dischargers than to maintain a flexible posture. This is the case for many technology based standards (*e.g.*, source performance standards under the Clean Air Act). In many cases, particularly for existing or aging industrial facilities, the strict technological basis is relaxed for the discharge standards. The modification might be based on the quality of the environmental resources affected, on the plant's ability to control pollution, or on the associated expense of control.[125] This leads to "inefficiencies" when permits require pollution sources that are located in relatively clean areas to meet tough control limits. Such an approach is clearly inappropriate for control of agricultural discharges.

Permits are ultimately only a tool for reducing agricultural pollution loadings. The water quality problem should determine the types of control measures included in a permitting system and the rigor of the designs of the control measures. For example, typically, two or three rainfall events are responsible for approximately ninety-five percent of the sediment discharged

125 Interview with Robert Ambrose, Manager, U.S. EPA Center for Exposure Assessment Modeling, in Athens, Ga. (Aug. 12, 1988).

annually into surface water bodies.[126] Establishing control measures that control sediment loadings for ninety percent of an area's storm events may have little effect on a water body that suffers primarily from excess sediment loadings. The remaining ten percent of extreme or "peak" events, which are left uncontrolled, are the predominant cause of the problem.

In contrast, single storm events may not have as great an impact on a eutrophication problem, which is caused by excessive nutrient loadings. Overall reduction of nutrients can be achieved by installing controls that reduce average or median loadings. In other words, trophic status can sometimes improve even if the assimilative capacity of control measures is temporarily overwhelmed, which allows for discharge of nutrients during occasional, extreme rainfall events.

Even eutrophication problems may require different strategies for different receiving waters within the area in which the permitting systems work. For example, if phosphorus constitutes "the limiting nutrient" in the eutrophication process, the measures required should differ from those cases where nitrate is the primary problem. A permit can control a phosphorus problem by mandating erosion controls to reduce sediment loadings. If the trophic status of receiving waters can only improve if nitrate levels are reduced, then focusing on other conditions, including fertilizer management or wet retention, might be a more appropriate strategy. In short, the selection of the management practice and the manner in which it is prescribed within the body of the permit ultimately should be determined by the overall water quality objective of the permitting agency within the specific watershed.

a) Site-Specific

Ultimately, regulations can only provide limited guidance for the selection of an appropriate practice to be prescribed in a permit. For example, even if a state decides that it wishes to rely heavily on a particular class of control technology (*i.e.*, structural), hydrologic soil classifications preclude mandating a specific form of retention or detention basins. A comparison by Camp, Dresser & McKee of the Florida stormwater management programs criticized both district and state regulations for failing to emphasize the site-specific nature of permitted control measures:

> Retention basins require porous soils and a sufficient depth to the seasonal high water table of bedrock in order to drain within the drawdown periods. Wet detention facilities require tight soils (low percolation rates) to prevent the permanent pool from being drained down during periods of drought. Dry detention facilities can be placed in either well or poorly drained soils if there is a method of bleed down which will restore the capacity of the facility to its required volume within the required recovery time.[127]

126 Camp, Dresser & McKee, *An Assessment of Stormwater Management Programs*, Draft Final Rep. Fla. Dep't Envtl. Reg., Oct. 1, 1985, at 5–3.

If other non-structural practices are integrated into permits for agriculture, site-specific characteristics may be even more important. For example, contour farming, a basic and relatively inexpensive practice for sediment control, is not effective in fields with gullies or rills. If terraces or stripcropping does not supplement the contouring, there is a critical slope length at which the contouring is not effective.[128] In Maryland, infiltration is emphasized as the management practice of choice due to the groundwater depletion that has been caused by the increase of impervious surfaces associated with urbanization. Thus, not only can control measures improve surface water quality problems, but they can also help solve subsurface water quantity problems and thereby replenish streams and rivers. The potential for the development of subsurface water quality problems, however, is generally not addressed when permit conditions are designated. Despite this, in many watersheds, particularly those with shallow aquifers and highly permeable soils, the trade-off between surface and groundwater quality is quite real.[129]

b) Linking Design to Performance

The provisions contained within agricultural permits must be consistent. Like any public body, environmental agencies cannot make arbitrary and capricious demands on permittees; this is both prohibited and inequitable. Indeed, local authorities note that permit conditions are the subject of legal and administrative disputes more frequently than actual compliance demands. Moreover, an underlying guideline or approach should link the management practice assignment process to actual water quality needs. In the context of existing permitting programs that use design standards, the

127 U.S. Dep't of Agric., Raleigh, N.C., *The Universal Soil Loss Equation with Factor Values for North Carolina, in* Technical Guide § I-C (1981).

128 S. Sivas, Groundwater and NPS (1988).

129 Interview with Carol Fall, Water Quality Specialist, St. Johns River Water Management District (Aug. 10, 1988).

criteria for selection of control measures can be divided into four groups:
(1) pre-permit and post-permit performance expectations;
(2) descriptive prescriptions about the impact of permitted activity on water quality,
(3) linking physical parameters and capacity to rainfall events; and
(4) rigid physical specifications for control measures.

2. Selection of Control Measures: Examples of the Approaches

a) Pre-Permit and Post-Permit Performance Expectations

As its rule-of-thumb, the St. Johns River Water Management District stipulates that "post-development" runoff must be less than or equal to pre-development runoff for a twenty-five year storm period. The fact that many farms are located within flood plains has made it extremely difficult for permittees to conform to this principle. Control measures must ensure extremely "low off-site discharge" despite high and frequent rainfall events.[130] Drainage calculations, which require hydrologic modeling, are generally included within the permit application.

b) Descriptive Water Quality Proscriptions

Another basis for control selection is "descriptive" performance criteria that set the underlying foundation for approval by South Florida permitting personnel. Section 40E-4.301 of the District's regulations specifies that an applicant must give reasonable assurance that the surface water management system:

> (b) will not cause adverse water quality and quantity impacts on receiving waters and adjacent lands;
> (c) will not cause discharges which result in any violation in surface waters of the state water quality criteria; and
> (d) will not cause adverse environmental impacts.

It is interesting to note that although assurances must be made regarding impacts on groundwater levels and flows, it is not necessary to account for groundwater quality in the permit application.

Despite its relatively simple language, applying this approach to actual development appears difficult. Questions such as "how do you prove absence of water quality impacts or adverse environmental impacts?" cannot be

130 Beyond drinking water standards, Florida has not set ambient standards for nitrates or phosphorus.

answered easily. State water quality standards are inadequate and do not address the problem of sediment build-up, and they provide little guidance.[131] Presumably, the District could issue guidelines that describe these otherwise "fuzzy" terms.

c) Linking Physical Parameters and Capacity to Rainfall Events

As noted, storm-event based standards are used in setting animal waste retention systems. For several years, South Florida has set design specifications in its Permit Information Manual. For example, retention and detention criteria are set forth as follows:

> a. Wet detention volume shall be provided for the first inch of runoff or the total runoff of 2.5 inches multiplied by the percentage of imperviousness (whichever is greater).
> b. Dry detention volume shall be provided equal to 75% of the amount given for wet detention.
> c. Retention volume shall be provided equal to fifty percent of the above amounts. Retention is only approved as a "BMP" after demonstration of long-term system bleed down ability, which is linked to soil percolation rates.

d) Physical Specifications for Control Measures

Pennsylvania regulations originally set rigid minimum design standards for control measures. For example, sedimentation basins were required to have a capacity of 7,000 cubic feet for each acre of project area, which had to include a twenty-four inch freeboard.[132] Diversion terraces were required to have the capacity to convey 2.75 cubic feet per second per acre of land tributary to the watershed, and they were to be lined with grass or other erosion resistant material.[133] There was also a blanket performance standard that limited the velocity of flow from any permanent facility to below 1.5 feet per second.

The South Florida District regulations provide similar design specifications, which include a requirement to reduce wet detention capacity by 0.2 inches for systems with inlets in grassed areas.[134] In addition, dimensional

131 Erosion Control Rules and Regulations § 102.13(d), 35 P.S. §§ 691.5, 691.402.
132 § 102.13(a).
133 Basis of Review, *supra* note 120, § 3.2.2.2.
134 Basis of Review, *supra* note 120, § 3.2.4.1.

criteria are specified in advance for retention/detention facilities. For instance, minimum area is set at 0.5 acres, side slopes can be no steeper than 4:1 (horizontal to vertical), and preference is expressed for twenty-five to fifty percent of a basin to be deeper than twelve feet.[135] Methods for calculation of drainage and supporting rainfall data are, however, site-specific and detailed within the permitting manual. These methods include delineation of expected cumulative percentage of peak one-day rainfall over a seventy-two hour period, estimates of soil storage capacity for the normal sandy soils found within the district, and numerous equations for allowable runoff in cubic feet per second for different design frequencies within the District.

In Pennsylvania, the Department of Environmental Resources reconsidered this approach. Recognizing the site-specific needs and in order to promote development of new and innovative control measures, state engineers embarked on a revision of Pennsylvania's Erosion and Sediment Pollution Control regulations. The changes have eliminated rigid design standards for such items as water courses and sediment basin designs. As described by a state official:

> [I]n place of rigid maximum or minimum standards for physical parameters such as channel capacity, flow velocities, basin volume and discharge rates, revisions have been made to require "capacity standards." For example, project water courses shall be designed to convey flows without deterioration, allowing the plan preparer full flexibility to design a channel as needed for the site-specific conditions instead of being limited by an arbitrary capacity or velocity limit. Channel capacities are only limited to minimum capacities such as Q^2 for temporary channels and Q^{10} for permanent channels. Likewise, sediment basins shall be designed to trap sediment at or below the calculated two year frequency runoff volume which results in a site-specific application for each design. This replaces a set capacity amount which obviously would over or underestimate the amount of storage volume required for any one site.[136]

135 Written Comments from Mike Stover, Pennsylvania DER (Nov. 1988). It should be noted that the performance of control measures is ultimately required to meet the statutory requirements prohibiting discharges into streams. Great emphasis is placed on use of "vegetative measures" including cover crops, mulches, and sodding.

136 Complaints are to be filed on a standardized form by any landowner or operator of land damaged by sediment or by any state agency or political subdivision whose property/activities are affected by the sediment runoff. Additionally, any public body responsible for maintaining water quality can also file complaints to NRDs. When districts are unable to resolve a situation through the negotiating process, they resort to the legal system, after inspection. Erosion and Sediment Control Act § 2-2, Neb. Rev. Stat. § 5601-8 (1988).

3. Comparing the Approaches

Assessing the relative merits of the different orientations for linking permits to water quality is problematic. Each approach was devised in response to a given hydrological and agricultural situation or was the product of the compromises that are inherent to public rule-making. For example, when non-structural measures are the management practice of choice, design storm standards, which originate from sewage pipe capacities, cannot be utilized. A combination of these approaches may, ultimately, offer the most effective and fair criteria. It is worth noting, however, that a primary advantage of the second and fourth strategies (descriptive water quality proscriptions and rigid physical specifications) is that they facilitate periodic adjustments within a permitting system in conjunction with improvements in technical understanding.

Given the uncertainties and large gaps in current knowledge, it is important to extend to the permitting agency the latitude to correct flaws in the permitting system. Although the descriptive approach used by Arizona and South Florida can be assailed as overly broad, allowing the districts almost unlimited discretion in assigning control measures, it does provide a substantive basis for requiring permit revision. Regardless of the method used to link design standards to water quality, it is essential that a regulatory agency spell out the rationale that underlies its environmental criteria. An agricultural community that understands this connection is more likely to meet the required management practice specifications.

XI. Enforcement and Regulation of Agriculture

Three distinct approaches are utilized to enforce environmental standards in the agricultural sector: (1) a complaint-response system; (2) self-monitoring; and (3) conventional inspection and compliance monitoring. Although, frequently, the choice in favor of a particular strategy is more a function of economic or political exigencies than an expression of the preference of environmental authorities, it is important to consider analytically the merits of each approach.

1. Complaint-Response System

In practice, most general prohibitions on runoff are enforced on the agricultural sector through complaint-response methods, which rely on the affected public to bring violations to the attention of the authorities. Rather than initiating inspections to check the adequacy of management practices in the field, inspections and enforcement actions are taken only when a direct complaint is made to the regulating agency. Indeed, a Nebraska statute prohibits NRDs from initiating on-site inspections for enforcement of the Nebraska sediment and erosion control law.[137] Only after a formal complaint has been received can an NRD send its technicians to a farm or to urban land to ascertain the severity of a runoff problem.

A variety of approaches are manifested in implementing the relevant laws vis-à-vis the identity of complainants. In Wisconsin, for example, the enforcement program for barnyard runoff is designed to protect the identity of a complainant. Because complaints are forwarded to the Department of Natural Resources, the anonymity allows district officials to call in complaints and avoid political fall-out. Other states, such as Nebraska, require a formal response to the complainant whose identity is always made public. The underlying assumption of the latter approach is that since agricultural pollution does not bother the public, it should not be considered a problem.

As indicated above, animal waste, because of its unaesthetic appearance and the potential for immediate health impacts, tends to cause the greatest stir among the general public and is most frequently reported. Many states, such as Alabama, limit public reporting to animal waste and feedlot management.[138] Complaint-response systems have proven to be effective for this type of pollution.

In the context of the Wisconsin program for small feedlots, for example, the DNR received, in 1986, 215 complaints of alleged water pollution caused by livestock operations. Subsequent to these complaints, fifty-four farm inspections revealed serious degradation and led to the issuing of Notice of Discharge letters, and approximately eighteen permits were issued following a lack of response by farmers.[139] The majority of inspected operations

137 Interview with Steve Jenkins, Nonpoint Specialist, Alabama Department of Environmental Management (Aug. 24, 1987).

138 Department of Natural Resources, Animal Waste Management, 243 N.R. 3 (July 1987).

139 Insofar as most animal waste permits require the operation of a structural BMP, monitoring and enforcement efforts by the state are not as demanding on farmers using non-structural BMPs. The primary obstacle, therefore, to animal waste BMP implementation is the initial capital costs. Once constructed, there are ample financial incentives, in most cases, to ensure effective control of animal wastes.

rectified the runoff problem, thereby preventing the need to issue a permit.[140]

There are three identifiable advantages to adopting a complaint-response system:

(1) it requires a smaller number of personnel for oversight;

(2) it focuses the attention of regulatory personnel on problems that impact the public; and

(3) it creates an improved political climate for subsequent regulation.

The third, political dimension deserves elaboration. Enforcement personnel typically enjoy greater public support for imposing a solution when the enforcement action is sparked by public complaints. Similarly, farmers and developers are more likely to respond to remedial suggestions when they are seen to arise from a problem that harms other landowners and not simply from arbitrary specifications in an overzealous regulatory program.

However, the very arguments that can be presented in favor of a complaint-response system for agricultural controls can be "turned on their heads" and viewed as liabilities. For example, in the context of quite a few sediment prevention programs, complaints have been utilized, at one time or another, as a weapon in an otherwise unrelated dispute between neighbors. Responding to the complaint of a hostile neighbor weakens the credibility of a district insofar as it can be perceived as taking sides. Moreover, the control measures subsequently required may not be judged on their actual merits and, as a result, may be resisted.

More importantly, the major drawback of a complaint-response system is that ultimately, it is a regulatory system driven by considerations other than water quality. Particularly when sediment control ordinances are enforced, response to complaints tends to focus district enforcement activities on property damage arising from sediment control rather than on water quality damage. The complaints that sparked a criminal prosecution of a farm operation in Pennsylvania[141] under the Clean Streams Law were submitted by adjacent suburban homeowners. Rather than deleterious impacts on water quality, the sediment loadings onto neighboring lawns engendered the stringent response.

Of course, there are exceptions to this type of situation. For example, in

140 B. Scott, Farmer Prosecuted for Runoff Violation (1988).

141 Interview with Carol Fall, *supra* note 129.

the St. Johns River Water Management District in Florida, the major constituency that avails itself of the complaint process is area fishermen.[142] (It may be worth noting that the St. Johns River District stretches primarily across flat Florida non-erosive soils.) Yet for the most part, sediment protection laws will not protect water quality if complaint-response is the sole method of enforcement. These laws do, however, yield positive results when they supplement a continuous or intermittent inspection presence.

2. Self-Monitoring by Regulatees

Self-monitoring is the basic enforcement strategy used by states as well as by the EPA to oversee the NPDES permitting program and similar provisions laid out in the Clean Water Act,[143] and as a strategy, it is increasingly being adopted in Israeli environmental statutes.[144] To be sure, the intermittent and diffuse nature of agricultural runoff often makes such systematic reporting impossible or meaningless. Nevertheless, the South Florida Water Management District uses annual reports, including self-monitoring, as a component of its permitting program's oversight of agricultural control operation and maintenance.[145] Problems of scientific competence can be alleviated by involving supplementary parties. For instance, the aforementioned high compliance of Central Platte (Nebraska) farmers in reporting results of deep-soil probes was achieved largely through the cooperation of fertilizer distributors.[146]

142 Discharge Monitoring Reports (DMRs) are submitted at regular intervals by permittees, describing their effluent discharges.

143 *See*, for example, Regulation 4 of the Abatement of Nuisances Regulations (Emissions of Particulates into the Air) from 1972. *Cf.* Public Health Regulations (Determination of Waste Water Standards), Regulation 3, 5440 K.T. 1033 (1992) (Isr.).

144 Interview with Steve Anderson, *supra* note 121.

145 Within the District, about sixty fertilizer dealers serve the 1,100 farms that lie within the "Phase II" areas where nitrate levels in groundwater are found to be high. This constituency was brought into the regulatory process at an early stage; not only have the dealers agreed to include testing as part ot their fertilizer services, but in most cases, they even fill out forms for farmers to describe the condition of the soil and underlying water. As a result, the groundwater protection program will probably entail no more than adding a part-time computer operator to the District staff. As a District official explains, while dealers were not enthusiastic about the cut in fertilizer sales caused by the regulations, they understood that if they did not help to make the program work, the less flexible state DEC or even the EPA might intervene. In addition, some of the costs of foregone sales could be recouped by charging for the deep soil probes and water sampling service. Interview with Ron Bishop, Central Platte Natural Resources District (Mar. 1989).

146 *Id.*

There are four primary advantages to a self-reporting enforcement scheme:
(1) it reduces manpower requirements for the enforcing entity;
(2) it involves the regulated community, which serves to lower suspicions and to create a greater sense of fairness;
(3) violations are easily detected; and
(4) self-enforcement is a less intrusive means of securing compliance in the majority of cases; assuming that most operations comply, this advantage should not be underestimated.

Among the more obvious drawbacks to such a system are:
(1) the potential for fraud or widespread non-compliance;
(2) the absence of quantifiable parameters within the self-monitoring report; and
(3) the potential regulatory burden imposed on the regulated community and the extension service.

The potential for fraud is a subject of serious concern. For example, Central Platte District officials acknowledge that it would be practically impossible to detect whether soil samples reportedly collected from each field were in fact taken from a single field in which no fertilization was carried out.[147] District officials, however, tend to believe that no fraudulent reports were submitted by the regulated farmers during the initial stages of the program. To a large extent, this can be attributed to the incorporation of fertilizer companies and laboratories into the self-reporting scheme. Indeed, the very livelihoods of these businesses depend upon their reliability and honesty toward the regulating agency.

A self-monitoring scheme generally involves some form of measurement and analysis. Yet in many cases, in order for a self-monitoring form to be easily understood, it must also suffer from oversimplification. The Central Platte District self-monitoring scheme benefits from the monolithic nature of its environmental problem, namely, nitrates in groundwater. Both the soil probes and water sampling examine only a single pollutant parameter for which analytical methods are well-established, inexpensive, and understood by the regulated community. However, if the ambient problem were to involve high concentrations of pesticides, for instance, analysis would be far more complex and would involve expensive laboratory time.

In the case of sediment control, it might not be sufficient simply to include

147 Interview with Robert Buker, *supra* note 72; Interview with Dave Land, CEO, Collier Enterprises Agricultural Company, Immocalee, Fla. (Aug. 8, 1989).

in an annual report a description of the control measures that have been employed. It is exceedingly difficult to convey in a report both the manner in which management practices are installed as well as the level of operation and maintenance. It is entirely possible that in filling out a self-monitoring form, a farm will report full compliance in good faith, when in fact, the system does not reduce soil loss and runoff as expected.

If, as in the case of pesticide monitoring, an analysis of numerous chemical parameters is required, self-monitoring is expensive and often inefficient. For example, in some South Florida districts, annual monitoring costs for large operations are reported to be as high as $100,000.[148] For smaller sized farms, the costs of sampling quickly become prohibitive. An inspection system can determine which operations have a high likelihood of contributing to water quality problems and can prioritize those lands for which additional monitoring is necessary. In the Israeli context, even if the Ministry of Agriculture contributes its facilities, duplicate samples (an important quality control measure) are not an option, given the scant laboratory and scientific resources available in most rural areas. Finally, the paper work generated by widespread monitoring can also quickly become overwhelming.

3. Conventional Inspection and Compliance Monitoring

Enforcement in a conventional inspection scheme is a multi-stage process:
(1) inspection;
(2) identifying a meaningful violation;
(3) offering a constructive solution; and
(4) ensuring compliance.

Various aspects of each stage will be assessed below in light of the experience in South Florida, where the enforcement scheme has been deemed to be extremely successful.

a) Activities During an Inspection

Inspection programs have proven to be effective in Florida's Water Management Districts when they include the following three characteristics:
(1) regular visits supplemented by periodic spot checks;
(2) inspection personnel with the technical acumen and expertise to propose and oversee solutions to any deficiencies while on-site; and
(3) a credible enforcement threat to leverage compliance.

148 Interview with Earl Shaver, *supra* note 109.

Inspection activities should be linked to the water resources that the agricultural program is designed to protect. Sensitive areas can be targeted in advance for more frequent visits. Ideally, inspection should be rigorous at each stage, yet experience has taught officials that ensuring compliance during the operational phase of agricultural control measures will generate the best reduction in loadings. This is fundamentally different from urban sediment control where construction is the phase during which discharges and damages are greatest. (There is a growing sense that post-operational surveillance should be a priority only for urban stormwater systems.[149] South Florida policy in this area, however, still focuses on the construction phase.[150])

Aerial surveillance and photographic documentation have proven to be important tools insofar as they enable agricultural enforcement programs to overcome many of the difficulties posed by the diffuse origins of any given water pollution problem. Clearly, little can be learned from the air regarding changes in water quality, with the exception of gross increases in turbidity from illegal construction. Nonetheless, in South Florida, helicopters have proven to be particularly effective in verifying whether structural practices have been installed.

Even if aerial surveillance from small aircraft is unavailable, aerial photography and remotely sensed images can assist in assessing the degree of implementation. Wisconsin Land Conservation Departments, which, each year, are required to inspect twenty-five percent of the 23,000 farms participating in the Farmland Preservation Program, have often found this the most effective screening process.[151] While rotations and large structural practices (*e.g.*, terraces) are easily identified in aerial shots, crop residues generally are undetectable. Thermal infrared photography may be able to provide additional information in some cases.[152] The St. Johns River Water Management District in Florida requires farm operations to submit annual vegetative monitoring reports, using infrared photography to detect shifts in marsh vegetation due to nutrient loadings.[153] In short, aerial photography is

149 Interview with David Unseld, *supra* note 117.
150 Interview with Clarence Kelloher, Lafayette County Land Conservation Department (Mar. 29, 1989).
151 Telephone Interview with James Fodroczi, *supra* note 47.
152 Interview with Carol Fall, *supra* note 129.
153 For brief discussions on the use of remotely sensed data in the nonpoint source and conservation field, *see* R.E. Pelletier, *Evaluating Nonpoint Pollution Using Remotely*

a valuable tool, but hardly a panacea or substitute for direct, on-site enforcement.[154]

The St. Johns River Water Management District conducts routine inspections, taking water samples at outflows and runoff sites of permitted operations and locations. Because human resources are limited, the specific number of tests that have to be conducted during a given year is calculated in advance. Agricultural sites are sampled less frequently than urban locations. For example, six samples of nutrients and pesticide scans are taken once a month on agricultural sites, compared with biweekly samples of turbidity or oil and grease testing at urban sites. Presumably, this is in response to the potential for acute contamination that can arise from dangerous accumulations of toxic pollutants.

A useful, but apparently non-essential, authority that should be included in the framework of an on-site inspection program is statutorily delegated power to enter private property in order to ensure appropriate implementation of control measures. The legislation of most states includes such a provision. New Jersey's sediment control law (the so-called "251" program), however, does not confer such authority, and a 1980 review of the program in *Rutgers Journal of Law* designated the absence thereof as one of the five major deficiencies of the program.[155] Clearly, granting field personnel access to polluting sites in order to inspect management practices is a crucial prerequisite in any enforcement scheme.

b) Frequency of Inspections

Not unlike any other targeting scheme, surveillance programs should set specific criteria to help prioritize inspection sites. In South Florida, included

Sensed Data in Soil Erosion Models, 40 J. Soil & Water Conservation 332 (1985); C.J. Johannesen & T.W. Barney, *Remote Sensing Applications for Resource Management*, 36 J. Soil & Water Conservation 128 (1981); R.A. Weismiller & S.A. Kaminsky, *Application of Remote-Sensing Technology to Soil Survey Research*, 33 J. Soil & Water Conservation 287 (1978).

154 W. Goldfarb & J. Heenehan, *Legal Control of Soil Erosion and Sedimentation in New Jersey*, 11 Rut.-Cam. L.J. 379, 391 (1980). In fact, districts have circumvented this flaw by enclosing a "boilerplate" clause in permit applications, whereby applicants agree "to allow District agents to go upon project lands for inspection" (New Jersey Natural Resources Conservation Program, Standard Form, Application for Soil Erosion and Sediment Control Plan Certification [hereinafter Standard Form]). Moreover, field inspectors claim that for many projects, entry onto construction sites is not necessary for determining compliance.

155 *See* the Maryland Stormwater Management Regulations 03(C).

among the criteria are land use intensity and changes in land use patterns. As water quality and quantity factors determine the surveillance priorities, the specific conditions of storm events as well as seasonal patterns (wet versus dry) may alter the surveillance schedule and priorities. The South Florida Surveillance Program, at a minimum, inspects different categories of development according to the following rates: industrial development — annually; commercial development — annually; residential development — once every five years; and agricultural development — as requested or as required by specific conditions. A commonly held sentiment among environmental regulators is that it is vital to conduct at least one random inspection each year.

The St. Johns River Water Management District employed fewer field personnel during the 1980s than its southern neighbor, South Florida Water Management District. Accordingly, the St. Johns District set a more modest operational goal of conducting inspections only at ten percent of permitted sites. (By way of comparison to urban programs, Maryland law requires that stormwater facilities be inspected once every three years, but state officials are moving to increase this schedule to a frequency of annual inspections.) To a certain extent, frequency of inspections should be determined by the nature of the control measures being inspected and by the severity of the water quality problem. For example, Arizona had planned to let its inventory of well water quality drive its inspection schedule for review of general permit compliance. Blanket provisions (such as the Pennsylvania requirement that conservation districts and the Department of Environmental Regulation staff perform monthly inspections of urban earth-disturbance sites) may lead to less than optimal utilization of resources. The longevity of control measures is by no means uniform,[156] and those requiring increased maintenance should be inspected with greater regularity. Moreover, actual rainfall patterns should influence the frequency of inspections. For example, infiltration trenches and diversions should be inspected following major storms, as maintenance may be required.

The issue of inspection frequency raises the single greatest obstacle to effective enforcement of agricultural pollution control programs: insufficient enforcement staff. Although most programs are currently attempting to increase the number of personnel working in this area, the results are still fairly dismal. Nowhere is the problem more acute than in Minnesota, where

156 A. Rosenthal & D. Urban, *BMP Longevity: A Preliminary Evaluation*, 1989 Rep. to EPA Office of Water (on file with author).

although animal feedlot permits have been issued to some 20,000 farm units, only five people have been hired by the state to oversee the entire program.[157] In Israel, the situation is, at least, just as problematic.

c) On-Site Permitting Enforcement Policies

For the purposes of enforcement, compliance with permit conditions can generally be reduced to a dichotomous variable; either permit conditions are being met, or they are not. If permits are well-written, design specifications will indicate which control measures should be in place and whether implementation is "sufficient" or "deficient."

Indeed, inspection officials from all regulatory systems agree that identifying a technical permit deficiency is relatively simple if the conservation plan or agricultural requirement adequately details the design specifications. Inspectors only need to compare the actual site with the conservation plan blueprint or with the staff report describing permit conditions.[158] Yet not all deficiencies are of the same magnitude, both in terms of their deviation from the permit requirements and in terms of their impact on water quality. Many officials feel that the virulence of an enforcement response should be determined solely by the danger posed to receiving waters.[159]

Clearly, when major components of a conservation plan or surface water management system have been neglected or when there are recurrent violations, a less benign enforcement response is warranted. Major deficiencies, however, are not always self-evident. Just as the relationship between water quality and agricultural requirements is enigmatic, designing enforcement policies to maximize environmental gains is far from simple.

Establishing "hard and fast" decision rules to this end is almost impossible. In the absence of an actual storm event, determining the potential impacts of

157 This shortage prompted a changeover to a "certification" system, with problematic operations receiving permits with more stringent inspection schedules. In addition, the state's enforcement policy was adjusted accordingly. If a complaint is received regarding a "certified" feedlot, a very tough enforcement posture is adopted. Many animal waste programs appear to be undergoing an evolutionary process where initial energies concentrate on the permit conditions and applications. Only when a substantial number of permits have been issued does the permitting agency turn its attention to enforcement. Telephone Interview with Kim Bryndleson, Minnesota Department of Natural Resources (July 18, 1988).

158 Telephone Interview with Carol Fall, Water Quality Specialist, St. Johns River Water Management District (Sept. 27, 1988).

159 Interview with David Bourdon, Prince George's County, Maryland Conservation District (Feb. 17, 1989).

a deficiency is a highly subjective venture and requires both professional field experience as well as an almost prophetic understanding of the relevant receiving water body. Florida's urban stormwater experience, as expressed by State Regulator John Cox, is relevant for agricultural discharges as well:

> The effects on receiving waters associated with most individual stormwater dischargers are extremely difficult to pin down. If a water body is sampled following the discovery of a deficiency and water quality standards are not in violation should the permitting authority conclude that the response is not severe and therefore subject to more lenient regulation? In reality, the failure to show an effect is just as likely due to the sampling regime, timing, location and parameters as anything else. Moreover, if a violation shows up, it is usually not possible to hang it on any one particular discharger where nonpoint sources are concerned.[160]

4. Proposing Solutions: Cooperation with Agricultural Extension Agencies

Cooperation between environmental agencies and agricultural extension services is a growing factor in ameliorating personnel shortages in state enforcement schemes. Both the expertise and the sheer numbers of agricultural personnel make them an invaluable resource. Upon discovering a violation, extension services can frequently facilitate a non-confrontational solution, either through identification of available cost-share funds or through preparation of an adequate discharge control plan.[161]

Cooperative ventures, in addition to being constructive by design, may also may engender good will. Surveys of regulated farmers in South Florida indicate that the single most common complaint voiced by farmers was the absence of water quality officials with agricultural backgrounds.[162] In contrast, surveyed farmers regulated by conservation districts under the Clean Streams Law in Pennsylvania did not raise this point as an issue. From the perspective of farmers, there is no substitute for experience in agriculture as a qualification for regulators. Even in educational contexts, extension ser-

160 Written Comments from John Cox, Florida DER (Jan. 11, 1989).

161 Interview with Moshe Sneh, *supra* note 31.

162 *See* A. Rosenthal, Agriculture and Water Quality: An Evaluation of State Environmental Programs (1989) (unpublished Ph.D. dissertation, Harvard University) (on file with the Harvard University Library).

vices find that academics are not as successful in convincing farmers to change their practices as active farmers are.[163]

In the United States, this type of cooperation between agencies is becoming increasingly formalized. In Oregon, the Soil Conservation Service almost single-handedly conducts the monitoring of permitted feedlot operations. Once a violation is recognized, the Department of Environmental Quality is called in to initiate enforcement procedures. In Maryland, the relationship between the Department of Agriculture and the Office of Environmental Programs was formalized in a ten-page memorandum of understanding. Agricultural representatives are given an opportunity to participate in inspections and to contribute substantively to the enforcement decision-making process.

Although cooperation is extensive, differences in orientation occasionally lead to friction between agricultural agencies and environmental agencies. In addition to the general hesitancy of agricultural officials to become involved in a regulatory proceeding, the different orientations and objective functions of the two types of agencies have proven to be divisive. Environmentalists in North Carolina, Florida, and several other states cite perennial dissatisfaction in situations where the most effective control measures for attainment of water quality goals do not necessarily involve strict erosion controls.[164]

5. Penalties for Violations

The sociological profile of the participants in an agricultural system differs from that of participants in other environmental programs, and this necessarily colors the tone of enforcement activities. The large number of players within a rural permitting framework and their extremely diverse economic means must be taken into consideration. Hence, even the most aggressive enforcement programs attempt to take a cooperative rather than an adversarial approach to agricultural violations. If water quality, and not generation of revenues, is to be the primary goal of an environmental program, such a conciliatory orientation is justified in most instances.

163 Milt Moravek, who directs the Central Platte groundwater protection educational program, explains that attempts to bring in professors from the University of Nebraska Department of Agriculture did not meet with success. The mere sight of an individual "dressed in a suit" was a signal to farmers that the lecturer was not in touch with their reality. *See* Interview with Milt Moravek, *supra* note 87.

164 Interview with Jim Cummings, N.C. Department of Natural Resources (Aug. 24, 1987); *see also* Telephone Interview with John Cox, *supra* note 96.

Nonetheless, the deterrent power of stiff fines is fairly well-documented. Maryland state sediment inspectors have found that their authority to issue administrative fines for urban construction violations has greatly enhanced the alacrity of developers in implementing recommended modifications.[165] The St. Johns River Water Management District sued a group of large neighboring muck farms for a total of $10 million in order to force the farms to take vigorous measures to improve Lake Apopka's moribund aquatic environment. This action provided the leverage necessary for reaching consent decrees with individual defendants who prefer to restore wetlands and to adopt ambitious surface water management practices rather than run the risk of expensive litigation and an unfavorable verdict.

Many environmental officials believe that in the long-run, punitive orientations are effective and inevitable for agricultural regulation. Reflecting on the experience in Florida, one state official concluded that increased utilization of sanctions is essential in agricultural programs:

> In my experience, applicants seem to be secure in the knowledge that the chances of being discovered in a violation are small. Even more remote is the probability that their oversights will result in a penalty that will make them think twice the next time. In my opinion this attitude prevails as a direct result of tendencies toward leniency in enforcement.[166]

Although the specific statutory and political realities of a permitting system tend to determine the severity of an enforcement response, certain common principles have emerged from agricultural regulatory programs:

(1) Legal actions surrounding permit non-compliance are far swifter than those surrounding establishment of permit conditions, which underscores the importance of reaching an agreement on permits and getting the control measures "on the ground."

(2) The possibility of bringing permit non-compliance into the criminal sphere (with its attendant stigma and option to impose costly penalties) enhances the effectiveness of administrative hearings as a forum for enforcement.

(3) Like any other injunction, stop-work orders, which require only "passive" cessation of an activity, are a relatively easy regulatory response to

165 Interview with Bill Jenkins, Maryland Department of the Environment (Feb. 17, 1989).

166 Telephone Interview with John Cox, *supra* note 96.

a violation by a recalcitrant farming operation. Demands for implementing additional practices or even improved maintenance may be substantially more difficult to realize, from the perspective of negotiation as well as litigation. The threat of substantial fines provides very important leverage in such situations.

XII. Conclusion: The Prospects of Environmental Regulation in Israel

Any discussion of different permit forms or the merits of conciliatory versus punitive permitting approaches may, ultimately, be moot in Israel, in light of the breakdown of authorities in the executive branch and certain political realities. Even today's unique political configuration, with Rafael Eitan serving as both Minister of the Environment and Minister of Agriculture, has not materially altered the roles and activities of the two ministries in this regard. For example, given the role of the Ministry of Agriculture in approving licenses,[167] it is unlikely that the Ministry of the Environment could pursue an extremely aggressive regulatory policy. Indeed, even in the United States, where presumably, the clout of the agricultural lobby is not as great as it is in Israel, attempts by several states to expand their agricultural control programs through mandatory schemes were stymied at the political level.[168] Nonetheless, it is important that Israeli environmental policy-makers consider regulatory options along the following lines.

167 Licensing of Businesses Law § 1(b), 22 L.S.I. 232 (1967–1968).

168 In the mid-1980s, the Environmental Division of the Michigan Department of Agriculture developed a proposal for a comprehensive permitting system under which all farms would be required to operate in accordance with the conditions of state-issued permits; the proposal was scrapped by the Governor's Office. Telephone Interview with Christine Lietzen, Director of the Environmental Division, Michigan Department of Agriculture (Sept. 9, 1987). The Iowa Department of Natural Resources has complained of heavy political pressure that has been brought to bear on the Department whenever a "sticky issue" arises regarding a large feedlot's compliance with NPDES requirements. Telephone Interview with Keith Brighton, Iowa Department of Natural Resources (Aug. 28, 1987). Because agriculture has remained the largest industry in the state, even in "progressive" California, the political climate is unfriendly with regard to most legislative or innovative regulatory initiatives for controlling the state's growing nonpoint source problem. For example, the existence of dangerous levels of herbicides in Sacramento drinking water sparked a proposal to require a change of rice species in the Sacramento area. Existing species, which require intensive herbicide usage, were to be replaced by alternative species; the proposal was rejected in its incipient stages. Telephone Interview with Oscar Balaguer, California State Resources Control Board, Division of Water (Sept. 8, 1987).

Regulatory activities generally can be divided into two stages: preventative initiatives and corrective initiatives. Insofar as the primary goal of an agricultural permitting program is protection of water quality, in theory the former stage should be the initial objective of a regulatory program. As a rule of thumb, the earlier activities contravening permit conditions are uncovered, the easier it is to correct them. The effort made to prohibit the opening of a chain of dairies in settlements on the Golan Heights whose discharges might affect water quality in the Sea of Galilee represented the first such preventative effort to be undertaken by Israel's Ministry of the Environment in the agricultural sector.[169] Given the Ministry's involvement in the planning and building process, this was a promising new direction for Ministry personnel to take.

Environmental efforts, however, must go far beyond planning if they are to address the range of environmental hazards posed by existing farm operations. There is little doubt that the Ministry has sufficient regulatory authority to push through reasonable requirements. The question is will such a program be effective? The following conclusions from the experiences of other countries provide a valuable starting point for devising an Israeli program.

(1) Based on increasingly sophisticated watershed models, regulators can assign levels of control measures that provide reasonable assurance of water quality protection. Manpower shortages (the primary logistical problem in assigning individualized permits), can be overcome by requiring farmers to consult with professional engineers or extension specialists to design the plans.

(2) Use of design standards (as opposed to performance standards) in permits will make enforcement relatively simple and speedy. These permits should include requirements for operation and maintenance.

(3) Selective permitting may provide incentives for individual farmers who have not received permits to implement management practices to avoid being targeted and permitted by the regulatory agencies.

(4) Enforcement efforts must be supported by field level personnel, although even the work of an understaffed inspection team can be made more effective by instituting self-monitoring requirements and using aerial surveillance, particularly for structural management practices.

169 Interview with Naftali Zlotshover, Director of Wastes and Water Department, Ministry of the Environment Northern District, in Nazareth, Isr. (Dec. 23, 1993).

(5) A "complaint-response" approach to enforcement is likely to provide benefits, primarily in compliance in the area of animal waste controls.

(6) While conventional penalties for off-site dischargers may, in theory, eliminate externalities and reduce artificial incentives to pollute, administrative stop-work orders may be far more effective in gaining farm compliance.

(7) Cooperation with agricultural agencies may be the key to the successful operation of an environmental regulatory program. Not only does the Ministry of Agriculture wield enormous leverage over farm operations through commodity quotas, water quotas, etc., but it also ultimately has the technical capabilities necessary to engineer a constructive solution to a pollution problem at the farm level.

Whether or not one agrees with the view held by the Ministry of Agriculture eschewing regulation, the technical expertise and rapport with farmers of the Ministry's affiliated extension service departments are invaluable for expediting environmentally-friendly farm activities. The 1993 budget estimates for *Shaham* and training and professional services were set at NIS 32,797,000,[170] which is a high proportion of the entire budget for the Ministry of the Environment. Hence, without a commitment to cooperation, any environmental regulatory program runs the risk of excluding the institution that is best equipped, professionally and historically, to tackle the problem of agricultural pollution.

The ability of the Ministry of the Environment to leverage agricultural officials has, to date, been minimal. For instance, a map demarcating areas where wastewater reuse is to be allowed is *not* adhered to by Ministry of Agriculture extension service specialists.[171] Similarly, in the realm of pesticides, recommendations are made today primarily on the basis of pest control efficacy, with insufficient regard for environmental impacts.[172] In the short term, the best that can be done by way of co-opting may be utilization of extension service specialists to craft solutions after the Ministry of the Environment identifies the polluters. Ultimately, if agricultural impacts on the environment are to be reduced, there must be, at the heart of a national regulatory strategy, a commitment on the part of the Ministry of Agriculture to participate at all levels in pollution prevention efforts.

170 Ministry of Agric., Proposed Budget for Fiscal Year 1994, at 3 (1993).

171 Interview with Moshe Sneh, *supra* note 31.

172 Interview with Reuven Osher, Director of Field Training, Plant Protection Branch, Ministry of Agriculture, in Tel Aviv, Isr. (Dec. 27, 1993).