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# Stormy Regulation: The Problems that Result when Stormwater (and Other) Regulatory Programs Neglect to Account for Limitations in Scientific and Technical Information

*Wendy E. Wagner**

On paper, the regulation of stormwater discharges in the United States appears to be a massive and growing enterprise. The Environmental Protection Agency (EPA) website educating the public and regulated parties about its extensive stormwater requirements provides dozens of reports, including detailed engineering assessments, best practices options, fact sheets, and EPA guidance documents, some of which are so enormous that they are almost too large to download.[1] Federal stormwater regulatory requirements involve two separate phases, multiple categories of regulated parties—each of which enjoys individualized treatment—and menus of best management practices (BMPs) to fit virtually any type of land use that creates polluted stormwater.[2] The EPA is currently in the midst of promulgating a revised "NPDES Stormwater Multi-Sector General Permit for Industrial Activities" (MSGP),[3] one of almost a dozen separate stormwater permit programs.[4] The stormwater regulatory program is so substantial that private companies have formed to help regulated parties navigate the requirements.[5] State and local programs only magnify the growing complexity. The State of California,

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[1] *See* EPA, National Pollution Discharge Elimination System (NPDES), http://cfpub.epa.gov/npdes/home.cfm?program_id=6 (last visited Feb. 6, 2006).

[2] *See, e.g.*, EPA, EPA 833-R-96-008, OVERVIEW OF THE STORMWATER PROGRAM (June 1996), *available at* http://www.epa.gov/npdes/pubs/owm0195.pdf [hereinafter EPA, OVERVIEW OF THE STORMWATER PROGRAM].

[3] EPA, NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES), PROPOSED 2006 MSGP, *available at* http://www.epa.gov/npdes/pubs/msgp2006_all-proposed.pdf (last visited Feb. 9, 2006). [hereinafter EPA, 2006 MSGP].

[4] *See infra* n.86 Figure 2.

[5] *See, e.g.*, StormwaterAuthority, http://www.stormwaterauthority.org (last visited Feb. 6, 2006).

Riverside County, and other locales in California add still another layer of implementing requirements on top of the EPA's unwieldy regulatory base.[6]

The million dollar question, though, is whether all of these regulations and guidance documents succeed in actually controlling this important source of water pollution. The federal Clean Water Act stormwater permit program regulates only a subset of all sources of stormwater runoff—those that occur at identified facilities, municipalities, and large construction sites.[7] But the contribution of pollutants from these larger stormwater sources appears to make up a significant portion of polluted runoff in urban watersheds.[8] The effectiveness of the EPA's stormwater permit program is thus an important piece in the larger puzzle of assessing the adequacy of current legal responses to the problem of urban runoff.

This article argues that the potential for success of this large and growing stormwater discharge program—at least as it is implemented at the federal level—is doubtful. The basis for this skepticism is not specific to the stormwater program. Instead, the stormwater regulatory program is illustrative of a larger problem that has plagued most environmental regulatory programs over the last thirty-five years: these programs are designed in ways that neglect to account for dramatic limits in scientific and technical information. Limitations in information constrain the options available to regulators to police the release of pollution or the manufacture of dangerous products. If regulations are designed in blatant disregard of these information constraints—for example, the fact that regulated parties often enjoy privately held, technical information regarding the risks posed by their products or activities—the programs are headed for trouble.

Behind this critique of the stormwater regulatory program, then, is a more general argument about regulation—namely that limitations in scientific and technical information cannot simply

[6] *See, e.g.*, Storm Water Protection Program, The Cities and County of Riverside ONLY RAIN IN THE STORM DRAIN Pollution Prevention Program, http://www.floodcontrol.co.riverside.ca.us/stormwater/ (last visited May 12, 2006). For a list of all Phase I municipal stormwater permits issued in the state of California, go to State Water Resources Control Board Water Quality, Storm Water Program, http://www.waterboards.ca.gov/stormwtr/phase_i_municipal.html (last visited May 12, 2006).

[7] *See* 33 U.S.C. § 1342(p) (2000); National Pollution Discharge Elimination System Permit Application Regulations for Storm Water Discharges, 55 Fed. Reg. 47990 (1990) (codified at 40 C.F.R. pts. 122–24 (1990).

[8] *See* EPA, EPA NO. 821-R-99-012, PRELIMINARY DATA SUMMARY OF URBAN STORMWATER BEST MANAGEMENT PRACTICES 4-23 (Aug. 1999), *available at* http://www.epa.gov/ost/stormwater/usw_b.pdf [hereinafter EPA, PRELIMINARY DATA SUMMARY].

be accommodated after a regulatory program has been established. We cannot decide, for example, that we want all waters fishable and swimmable or the air safe for all persons and then figure out how science can get us there. Instead, competent regulatory design requires an assessment of what science and other sources of technical information can and cannot offer—at the front end of regulatory design. Limits in available information should inform both the ends and the means of how we choose to regulate. Such a front-end assessment of the available technical and scientific information is likely to lead to regulatory programs that look quite different from the programs currently in place, including the federal program regulating stormwater discharges.

The argument that the stormwater regulatory program ignores important limits in available information unfolds in three parts. Part I makes the larger argument that successful environmental regulation must consider the limits of available scientific information and design regulatory requirements around those constraints rather than trying to address these limitations at the back-end, after the program has been established. Examples from several regulatory programs make it clear that this oversight is neither new nor isolated to the stormwater runoff program. Part II then outlines the specific types of information constraints that plague stormwater regulation and identifies how the EPA's design of the stormwater discharge regulatory program neglects these constraints and, at some level, seems to flaunt them. While the failure of the stormwater program to adequately account for and design its regulatory program around these information constraints may not devastate the program, these failures will likely reduce its effectiveness considerably, particularly in areas where local or state governments are not enthusiastic about reinforcing the program with more stringent requirements. Part III closes the article on a more hopeful note by suggesting some opportunities to redesign the federal stormwater program to better take into account the information that is and is not available to regulators. While these proposals are not a panacea for this very challenging field of regulation, they are likely to be more successful than the current federal program.

## I. INFORMATION CONSTRAINTS IN ENVIRONMENTAL REGULATION

It is well-established that science is pivotal to most environmental regulation. It is also well-established that the supply of this scientific and technical information is far less than is needed to produce effective or comprehensive regulations of man-made

harms.[9] Despite these well-settled truths in environmental regulation, there seems to be little effort to apply them in the practice of regulatory design. Some of this neglect is forgivable—a fair number of our programs have their origins in the early 1970's when regulators were still learning by trial and error. But some of the worst offenses—a category that includes stormwater regulatory programs that began in earnest in the 1990's—are far more recent and should have been designed in ways that benefited from past mistakes.

### A. Information Constraints in Environmental Regulation—The Theory

The idea that information can be limited and that policy analysis and decision-making models must account for these limitations is a relatively new innovation. Economists Joseph E. Stiglitz, George A. Akerlof, and A. Michael Spence were awarded the Nobel Prize in 2001 for their groundbreaking research on asymmetrical information in markets.[10] As a result of their work, "much of what economists believed—what they thought to be true on the basis of research and analysis over almost a century—turned out not to be robust to considerations of even slight imperfections [otherwise known as asymmetries] of information."[11] Economists are now forced to change their assumptions based on the discoveries that information asymmetries can affect institutional and individual behavior in important ways.

At a theoretical level, then, we now understand that limitations in information can impose significant and sometimes insurmountable roadblocks to particular ways of doing things. This does not mean that existing regulatory programs are doomed to fail. It does mean that successful regulatory design must first identify the limitations in scientific and technical information that exist and then develop the regulatory program around these constraints.

In environmental regulation, there are at least three different types of significant limitations in information that occur with regularity and must be accommodated in regulatory design. First, there is the familiar problem of "uncertain information" that involves scientific and technical questions that are unlikely

[9] *See, e.g.*, Oliver Houck, *Tales from a Troubled Marriage: Science and Law in Environmental Policy*, 302 SCI. 1926, 1926 (2003).

[10] *See* Nobelprize.org, http://nobelprize.org/economics/laureates/2001/index.html (last visited Feb. 6, 2006).

[11] Joseph E. Stiglitz, *The Contributions of the Economics of Information to Twentieth Century Economics*, 115 Q. J. ECON.1441, 1461 (2000) (emphasis omitted).

to have immediate or even short-term answers.[12] Some of this uncertainty is due to limitations of scientific knowledge. Scientists do not understand mechanisms of carcinogenicity, hormone interactions, or neurological effects sufficiently to explain or predict how chemicals will interact in humans or animals.[13] Some of the uncertainty is also due to resource constraints. Even with the limited scientific knowledge we do possess, we often lack resources to conduct basic tests or conduct extensive monitoring to resolve uncertainties relevant to regulation. For example, comprehensive monitoring of the environment would tell us something and perhaps a great deal about environmental quality, but it is exceedingly expensive and we lack the resources to conduct most of it.[14]

A second type of information constraint results from asymmetric or "imperfect information."[15] Some information may be available, or nearly so, only it lies with certain parties who are disinclined to share it.[16] The problems of asymmetrical information are substantial in regulating private actors, and as elaborated later, they are particularly significant in stormwater regulation. Many regulated actors sit atop "mountains of detailed facts" about the nature of their polluting activities and "amass specialized private expertise about the ways these activities" and land uses could introduce pollutants into the environment.[17] Since their property is private, access to information about the pollutants that might be present in stormwater runoff is generally not available to neighbors or regulators unless these groups are granted permission to enter the site, and even then, pollutants may not be readily apparent in a visual inspection.[18] Even to the extent that these regulated parties do not have direct in-

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[12] *See* Wendy E. Wagner, *Commons Ignorance: The Failure of Environmental Law to Produce Needed Information on Health and the Environment*, 53 DUKE L.J. 1619, 1742 (2004).

[13] *See, e.g.,* COMM. ON HORMONALLY ACTIVE AGENTS IN THE ENV'T ET AL., HORMONALLY ACTIVE AGENTS IN THE ENVIRONMENT 1–7 (1999) (identifying great scientific unknowns for hormonally active agents, including mechanisms of action, and identifying several major areas for needed future research).

[14] *See, e.g.*, COMM. ON RESEARCH OPPORTUNITIES AND PRIORITIES FOR EPA ET AL., BUILDING A FOUNDATION FOR SOUND ENVIRONMENTAL DECISIONS 19, 21, 25, 31 (1997) (discussing in concrete terms the drastic need for basic monitoring and citing other EPA studies similarly concluding that there is a need for better environmental monitoring).

[15] *See* Claus Huber & Franz Wirl, *The Polluter Pays Versus the Pollutee Pays Principle Under Asymmetric Information*, 35 J. ENVTL. ECON. & MGMT. 69, 69 (1998).

[16] *See, e.g.*, *id.* at 71 (assuming that a polluter has asymmetric information on the benefits of the polluting activity).

[17] Wagner, *supra* note 12, at 1641–42.

[18] *See* Stephen Polasky & Holly Doremus, *When the Truth Hurts: Endangered Species Policy on Private Land with Imperfect Information*, 35 J. ENVTL. ECON. & MGMT. 22, 26–29 (1998) (discussing the asymmetrical advantages that private owners enjoy with respect to the presence of endangered species on their land).

formation about the nature of the stormwater pollution problems at their site, they are generally in a far better position to obtain information about the effects of their activities than others.[19] Regulated parties know approximately where or what to sample and what present or past practices might deserve closer inspection, even though they may not have yet done the research. Actors thus also have superior access to information because they have an "inside track" on where to obtain it and what to look for.[20]

The third type of science constraint arises while scientific research or information is still emerging (called "emergent information") and has not been fully vetted or accepted by the scientific community.[21] In the peculiar setting of regulatory controls, some of this emergent information about toxicity or environmental quality will not be welcome by a large and influential sector of the affected interests—namely regulated parties.[22] Instead, it will be hotly contested.[23] Given the evolving nature of scientific discoveries and the loose system of scientific governance that presides over these discoveries, there is no quick and dirty way for regulators to judge the point at which this developing science is reliable enough to form the basis for regulatory controls.[24] The fact that the information is likely to be hotly contested extends the time during which scientific research can, in practice, actually inform regulatory programs and constitutes another information constraint.[25] As a result, even when useful scientific information is produced, the adversarial nature of the legal system may lead to extensive contests over the reliability of that information for years before it is accepted as reliable for purposes of regulation.

In designing a regulatory program, in theory, one would first identify the types of information needed to establish and meet regulatory goals. Next, one would assess the extent to which this needed information is handicapped by one or more of these types of constraints. If the information is effectively unavailable because it is uncertain, asymmetric, or contested, then it is critical

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[19] *Id.*

[20] *See, e.g.*, Wagner, *supra* note 12, at 1641–49.

[21] *See* Timothy Caulfield, *The Mass Media's Influence on Health Law and Policy: Symposium: Popular Media, Biotechnology, and the "Cycle of Hype,"* 5 HOUS. J. HEALTH L. & POL'Y 213, 220 (2005).

[22] *See, e.g.*, David Michaels & Celeste Monforton, *Scientific Evidence in the Regulatory System: Manufacturing Uncertainty and the Demise of the Formal Regulatory System*, 13 J.L. & POL'Y 17, 17–18 (2005).

[23] *Id.*

[24] *See* THOMAS MCGARITY & WENDY WAGNER, BENDING SCIENCE ch. 3 (Jan. 9, 2006) (book in progress, on file with author).

[25] *See, e.g.*, Wagner, *supra* note 12, at 1649–59.

to devise a regulatory strategy that finds a way around these constraints. For example, a common problem in many pollution control programs is their failure to anticipate and work around substantial asymmetries in information between the regulated and the regulators.[26] Regulatory parties often enjoy far more information and access to information about their potential health or environmental harms than regulators.[27] Yet many regulatory programs ignore these prevalent information asymmetries and place the burden on regulators to discover health and environmental risks. Our current regulatory programs governing the filling of wetlands,[28] fugitive sources of toxic air pollution,[29] the discovery of contaminated land,[30] and the manufacture and sale of chemicals[31] all fall prey to this particular blind spot. By failing to take the asymmetrical information of the regulated party into account, they establish regulatory regimes that are barely enforceable and can lead to substantial noncompliance. Similarly, a regulatory program that expects existing scientific research and data to magically reveal the point at which a pesticide presents "unreasonable adverse effects,"[32] when air pollutants are controlled sufficiently to "allow[] an adequate margin of safety [to]

[26] *Id.* at 1641–42.

[27] *Id.*

[28] Under current law, wetland developers are not required to conduct research on the wetlands they hope to fill to show that they are not environmentally valuable. *See* 33 U.S.C.A. § 1344 (West 2001). On the contrary, opponents to the development must bear the burden of conducting this research, even though the land is often privately held and its owners can deny the access needed for research.

[29] Federal Clean Air Act regulations provide facilities with fugitive sources of air toxins wide latitude in self-monitoring their compliance with required pollution control equipment. Under the regulations, a facility is required to self-inspect to ensure compliance with technology-based requirements for fugitive emissions sources only at specified intervals, sometimes as infrequently as once per year. *See* Storage Vessel Provisions—Procedures to Determine Compliance, 40 C.F.R. § 63.120(a) (2004) (requiring visual inspections only once annually for storage vessels). When a facility catches its own violation, there is a period of time during which the facility can repair the problem without penalty. Under some fugitive pollution rules, this excused repair time can be as long as forty-five days. *See* 40 C.F.R. § 63.120(a)(4) (2004).

[30] Actors owning land that leaches toxic substances onto neighboring land, into public recreational resources, or into other water supplies (including drinking water supplies), are effectively immunized from reporting their pollution if the amount "appears" smaller than the reportable quantities defined by regulations. *See, e.g.*, Clean Water Act, 33 U.S.C. § 1321(b)(5) (2000) (requiring reports of spills of oil and hazardous substances only above a threshold amount and, even then, only from vessels or facilities, thus excluding runoff); Comprehensive Environmental Response Compensation and Liability Act of 1980, 42 U.S.C. § 9603(a) (2000) (requiring reports of releases of hazardous substances only if they exceed a "reportable quantity"). The contamination may only be discovered if a governmental entity or other third party identifies the problem.

[31] *See* Mary L. Lyndon, *Information Economics and Chemical Toxicity: Designing Laws to Produce and Use Data*, 87 MICH. L. REV. 1795, 1813 (1989) (noting that there is currently little incentive for chemical manufacturers to undergo expensive testing merely to point out the flaws in their own products).

[32] 7 U.S.C. § 136a(c)(5)(D) (2000).

protect the public health,"[33] or when surface waters are sufficiently free from pollutants to ensure protection of "the public health or welfare,"[34] is setting itself up for failure.[35] Regulated parties will not only contest the science that exists to answer these questions, but regulators will find tremendous uncertainties that lack clear answers. For example, Dr. Ken Reckhow, the Department Chair at Duke University's Nicholas School for the Environment, has found that water quality modeling—in the absence of extensive supporting water quality data—is often so error-laden that it might not produce information that is useful at all.[36] Many regulatory programs, including the Total Maximum Daily Load (TMDL) program of the Clean Water Act do not appreciate these severe information constraints.[37] Instead, by insisting that regulatory requirements be based on scientific models that are often badly data-deprived and laden with theoretical uncertainties, these programs encounter decades of contested science and resultant regulatory paralysis.[38]

### B. Information Constraints in Environmental Regulation—The Practice

Although the bad examples—where regulatory programs fail to account for prevailing information constraints—far outnumber the good examples, the Clean Water Act National Pollutant Discharge Elimination System (NPDES) program governing industrial effluent conveniently provides a particularly good example of a regulatory program that accounts for several critical information constraints in its regulatory design.[39] In devising the NPDES program of the Clean Water Act, Congress reacted to the substantial uncertainties and imperfections in scientific information that plagued its past efforts to regulate water pollution, and developed a program that circumvents these constraints.[40]

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[33] 42 U.S.C. § 7409(b)(1) (2000).

[34] 33 U.S.C. § 1313(c)(2)(A) (2000).

[35] *See generally* Wendy E. Wagner, *Congress, Science, and Environmental Policy*, 1999 U. ILL. L. REV. 181 (1999).

[36] K. H. Reckhow & S.-C. Chapra, *Modeling Excessive Nutrient Loading in the Environment*, 100 ENVTL. POLLUTION 197, 206 (1999) (discussing problems in water quality modeling, much of which stem from inadequate data, and concluding that "it should not be surprising that theoretically based improvements in a model often cannot be supported with the limited available observational data").

[37] *See, e.g.,* Oliver A. Houck, *TMDLs IV: The Final Frontier*, 29 ENVTL. L. REP. 10469, 10474-79 (1999) (detailing the series of scientific obstacles that arise in the TMDL program).

[38] *Id.*

[39] *See, e.g.,* 33 U.S.C. § 1314(b)(1)(B) (2000).

[40] *See* H.R. REP. NO. 92–911, at 396 (1972) (statement of Rep. Charles Rangel) (observing that "the history of our water pollution control program suggests that State and Federal governments will continue to founder on the staggering complexity of this control system, which requires working mathematically back from the permitted pollution levels

As a scientific matter, when the Clean Water Act was passed in 1972 and to a large extent today, scientists are able to tell us very little about how much pollution a water body could assimilate before encountering significant ecological damage or presenting serious health risks.[41] Even when policymakers set a numeric concentration for a particular pollutant—a level of acceptable dioxin in rivers and lakes in Virginia, for example—scientists cannot assure us that the level of discharges that can be tolerated from various point sources, much less the nonpoint sources, in order to keep the water quality at roughly that acceptable level.[42]

Yet despite these and many other unknowns, Congress refused to become paralyzed by the scientific and technical constraints that plague water pollution regulation.[43] One thing that is clear scientifically—both in 1972 and today—is that water pollution is significant, presenting both health threats and ecological damage.[44] Scientists have discovered 362 toxins in Great Lakes water, sediment, and biota; this discovery tells us that man-made impacts are impairing lake ecosystems.[45] Alterations in the diversity and types of species inhabiting some streams indicate water quality impairments.[46] Swimmers recreating near sewer outfalls experience higher levels of respiratory and other maladies than swimmers recreating further downstream.[47] At an aggregate level, then, there is little question that serious impairments to some waters result from pollutant loading and that reducing those loadings will make a positive difference to human and ecological health.

In order to implement this general scientific knowledge without hanging up the regulatory program on the scores of more specific water quality unknowns, Congress devised an ingenious system that simply required—in very specific and enforceable ways—that at least those actors discharging wastes into water

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in a waterway to the effluent limitations at the point source needed to achieve them").

[41] *See, e.g.*, Robert W. Adler, *Integrated Approaches to Water Pollution: Lessons from the Clean Air Act*, 23 HARV. ENVTL. L. REV. 203, 211–12 (1999) (discussing some of the scientific uncertainties in setting water quality criteria); Oliver A. Houck, *The Regulation of Toxic Pollutants Under the Clean Water Act*, 21 ENVTL. L. REP. 10528, 10529–31 (1991) (detailing a series of major scientific uncertainties encountered in the effort to set ambient water quality standards that must be squarely addressed in order to arrive at a final standard).

[42] *See, e.g.*, Houck, *supra* note 37, at 10472.

[43] *See* 33 U.S.C. § 1314(b)(1) (2000).

[44] *See, e.g.,* EPA, The Effects of Great Lakes Contaminants on Human Health, *available at* http://www.epa.gov/glnpo/health/atsdr-ref.htm (last visited Feb. 7, 2006).

[45] *See, e.g.*, *id.*

[46] *See, e.g.*, EPA, PRELIMINARY DATA SUMMARY, *supra* note 8, at 4-35 to 4-36, 4-39 to 4-43.

[47] *See, e.g., id.* at 4-44 to 4-47.

through a pipe "do their best" to reduce pollution.[48] This requirement circumvented one of the major information constraints that plagues many other regulatory systems—the problem of scientific uncertainties. In its regulatory design, Congress resisted the need to get specific answers for the point at which waters were degraded or the types of regulatory controls that would be needed to clean them up.[49] Instead, this "do our best" or technology-based pollution control approach simply requires the main dischargers to limit their loadings to what regulators determine is technologically feasible.[50]

Congress also directly confronted the problems of asymmetric information enjoyed by regulated parties in designing the NPDES program.[51] Industrial dischargers have superior knowledge of what "doing their best" encompasses and whether they are actually accomplishing that "best" on a daily basis. Rather than task poor regulators with the job of checking on the representations of regulated parties that they are minimizing their pollution loads, Congress also instructed the EPA to find out—on an industry-by-industry basis—what doing one's best actually was and to put that result into a single numerical effluent standard that applied to all similar industries.[52] In this way, the regulator would have the burden of devising categorical industry effluent limits, but once put in place, there would no longer be the need for regulators to become familiar with the capabilities of individual dischargers in order to finalize permit requirements.[53]

An even more brilliant element of the NPDES program is the self-monitoring requirement. Because dischargers have considerable asymmetrical information regarding whether they are in compliance with generic effluent limits, Congress, with the help of the EPA, devised a scheme whereby all regulated parties

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[48] *See* Thomas O. McGarity, *Media-Quality, Technology, and Cost-Benefit Balancing Strategies for Health and Environmental Regulation*, 46 LAW & CONTEMP. PROBS. 159, 199 n.194 (1983) (quoting Senator Bayh as explaining that the technology-based standards adopted in the 1972 Clean Water Act were intended to "force industry to do the best job it can do to clean up the nation's water and to keep making progress without incurring such massive costs that economic chaos would result.") (citing Senate Comm. on Pub. Works, 93D CONG., 1ST SESS., LEGISLATIVE HISTORY OF THE WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972, at 1133 (1973)); *see generally* 33 U.S.C. § 1311 (b)(2)(A) (2000), 33 U.S.C. § 1314(b) (2000), 33 U.S.C. § 1342(a)(1)-(3) (2000).

[49] Michael R. Bosse, *George J. Mitchell: Maine's Environmental Senator*, 47 ME. L. REV. 179, 184 (1995) ("Congress's intent is to reevaluate environmental statutes such as the Clean Water Act periodically to ensure that the law reflects the current state of ongoing scientific knowledge and changing circumstances.").

[50] *See, e.g.,* 33 U.S.C. § 1314(b)(1)(A) (2000).

[51] *See, e.g.,* 33 U.S.C. §§ 1342(a)(1)–(3) (2000).

[52] *See, e.g.*, Du Pont v. Train, 430 U.S. 112, 129 (1977).

[53] John H. Minan, *Municipal Separate Storm Sewer System (MS4) Regulation Under the Federal Clean Water Act: The Role of Water Quality Standards?,* 42 SAN DIEGO L. REV. 1215, 1232 n.95 (2005).

would monitor their own effluent at regular intervals.[54] While some asymmetries in information remain and their existence undercuts compliance,[55] the private informational advantages of the discharger are generally overcome by this regulatory scheme: dischargers have few choices but to monitor their effluent honestly and to disclose those effluent numbers to regulators and the public at large.[56]

In short, the NPDES program circumvents the largest problems of uncertain and imperfect information. Once the effluent standards were promulgated, this left the EPA with a regulatory program that could be implemented relatively smoothly—at least in comparison to science-dependent regulatory programs. Moreover, the likelihood of regulated parties holding up the program by contesting emerging scientific information is also circumvented since scientific information is generally not relevant to this technology-based standard-setting and permitting process.[57]

But the NPDES program governing industrial effluent is hardly perfect. It was so skillful in circumventing the need for scientific information that it neglected to develop mechanisms for collecting water quality data that might enable more science-intensive regulation in the future.[58] The "do your best" standard, in fact, will not achieve even the most primitive water quality objectives (sight and smell) in some settings where a water body cannot assimilate numerous industrial discharges that enter the water at once.[59] Thus, the need for some second-tier, science-based form of regulation was inevitable, but was not established in a coherent way. However, with this one important exception, the NPDES program exemplifies smart regulatory design, at

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[54] *See* 33 U.S.C. § 1318(a)(A) (2000).

[55] *See generally* U.S. GEN. ACCOUNTING OFFICE, GAO/RCED-93-21, ENVIRONMENTAL ENFORCEMENT: EPA CANNOT ENSURE THE ACCURACY OF SELF-REPORTED COMPLIANCE MONITORING DATA (Mar. 1993), *available at* http://archive.gao.gov/t2pbat6/149103.pdf [hereinafter GAO, ENVIRONMENTAL ENFORCEMENT] (finding that sampling methods employed by regulated parties were not reviewed by EPA inspectors in roughly two-thirds of the states surveyed, enabling regulated parties' accidental errors or deliberately falsified results to remain undetected).

[56] *See, e.g.*, Wendy E. Wagner, *The Triumph of Technology-Based Standards*, 2000 U. ILL. L. REV. 83, 101–03 (2000).

[57] *Id.* at 1651–53 (noting that when science-based standards are used, the strategy employed by many regulated parties is to discredit the science behind the standard: "In some cases, because of the inherent complexity of the studies, even if high-quality technical research can be at least temporarily discredited by making groundless challenges about the methods used, the reliability of the data collected, the qualifications of the researcher conducting the study, or by suggesting that the review processes are flawed.").

[58] *See* William F. Pedersen, Jr., *Turning the Tide on Water Quality*, 15 ECOLOGY L.Q. 69, 84-85 (1988).

[59] It is obviously difficult to set water quality control standards when there are multiple sources of pollution entering a single body of water at once. *See, e.g.,* Esther Bartfeld, *Point-Nonpoint Source Trading: Looking Beyond Potential Cost Savings*, 23 ENVTL. L. 43, 74 (1993).

least with regard to its maneuverability around significant information constraints. In fact, critics of the program have been far too quick to overlook the severity of information constraints and the program's effectiveness in overcoming them.[60]

## II. FEDERAL STORMWATER DISCHARGE REGULATIONS: THE NEGLECT OF THE INFORMATION CONSTRAINTS

Stormwater discharge regulation is set within this larger NPDES program that governs industrial effluent discharges and ranks among the best at identifying and working around potentially fatal significant science constraints.[61] But the extension of the NPDES program to the regulation of stormwater discharges neglects the underlying information constraints that explain why the NPDES program developed in the way it did. As a result, stormwater regulation ironically runs headlong into precisely the same types of information constraints that the NPDES program was designed to avoid.

### A. Background: The Science and Law of Stormwater Discharge Regulation

The regulation of stormwater runoff confronts the same scientific constraints that plague controlling pollutants in industrial effluent, but encounters added uncertainties in quantifying the variable pollutant loads that occur in runoff. At the same time, much like the traditional NPDES program, those in charge of the land or outfalls that carry the runoff into the waters enjoy considerable private information or access to information about the types of problems that might be occurring at their sites.[62]

#### 1. Additional Uncertainties in Characterizing Stormwater Runoff

As is the case for industrial discharges, there are large scientific uncertainties involved in attempting to trace specific sources of stormwater runoff to individual environmental or health harms. While broad scientific connections can be made (i.e., fecal coliform loadings do not make for good swimming conditions), it has been difficult to move beyond these very general correlations between pollution and public health and environmental harms.[63]

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[60] *See, e.g.*, BRUCE A. ACKERMAN ET AL., THE UNCERTAIN SEARCH FOR ENVIRONMENTAL QUALITY 328–30 (1974); Bruce A. Ackerman & Richard B. Stewart, Comment, *Reforming Environmental Law*, 37 STAN. L. REV. 1333, 1335–37 (1985).

[61] *See, e.g.*, Wagner, *supra* note 56, at 96–97.

[62] *See generally* GAO, ENVIRONMENTAL ENFORCEMENT, *supra* note 55 (explaining the EPA's use of self-reporting for monitoring compliance and also under the wastewater discharge and hazardous waste programs).

[63] *See, e.g.,* EPA, PRELIMINARY DATA SUMMARY, *supra* note 8, at 4-44 to 4-47.

Scientists have, however, attributed significant adverse water quality consequences to cumulative stormwater runoff.[64] Given the role of precipitation in mobilizing many of the pollutants, stormwater loadings are obviously far more variable than traditional industrial sources; this runoff includes some very toxic substances and large amounts of sediment that impair water quality.[65] Scientists have also identified major sources of pollutants in stormwater runoff that include motor vehicle exhaust, construction activities, industrial operations, and suburban lawn products like fertilizers and pesticides.[66]

But there are some added uncertainties that affect the regulation of stormwater runoff. First, measuring the effectiveness of site controls designed to minimize pollutants in stormwater runoff is considerably less certain than isolating the effluent pollution control gains made at an industrial operation as a result of installing the best pollution control technology.[67] In the industrial effluent NPDES program, the EPA was able to identify an industry "average" within a category—like an average iron manufacturer that makes iron using a blast furnace—and then quantify the pollutants in the effluent of that average factory if it installs the best available pollution control technology.[68] Although there are inevitable error bars surrounding these average effluent limitations, the error bars remain sufficiently small and most facilities are still able to comply with the promulgated effluent limits. By contrast, the error bars and uncertainties surrounding the pollution control capabilities of various BMPs for any given industrial site, construction site or municipal storm sewer are far larger and could vary substantially from one property to another.[69] Natural causes of variation in the pollutant loads in stormwater runoff include the topography of a site, the soil conditions, and of course, the nature of storm flows in intensity, frequency, and volume.[70] In addition, the manner in which the facility stores and uses materials, the amount of impervious

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[64] *See, e.g., id*. at 4-48; EPA, NATIONAL WATER QUALITY INVENTORY: 1994 REPORT TO CONGRESS, EXECUTIVE SUMMARY 24 (1994), *available at* http://www.epa.gov/owow/305b/94report/nat_sum.pdf (noting the significant contributions of pollution that stormwater runoff makes and attributing 46 percent of the identified cases of water quality impairment in estuaries to storm sewer runoff).

[65] *See, e.g.*, EPA, PRELIMINARY DATA SUMMARY, *supra* note 8, at 4-6.

[66] *See, e.g.*, *id.* at 4-9.

[67] *See, e.g.,* EPA, OFFICE OF RESEARCH AND DEVELOPMENT, EPA/600/R-04/184, THE USE OF BEST MANAGEMENT PRACTICES (BMPS) IN URBAN WATERSHEDS 4-2 (Sept. 2004), *available at* http://www.epa.gov/ordntrnt/ORD/NRMRL/pubs/600r04184/600r04184.htm [hereinafter EPA, THE USE OF BEST MANAGEMENT PRACTICES].

[68] *See, e.g.,* 40 C.F.R. § 420.33(a) (2004).

[69] *See, e.g.,* EPA, THE USE OF BEST MANAGEMENT PRACTICES, *supra* note 67, at 5-15 to 5-17.

[70] *Id*. at 5-12 to 5-15.

cover, and sometimes even what materials the facility uses can vary and affect pollutant loads in runoff from one site to another.[71] Together these sources of variability—particularly the natural features—make it much more difficult to identify or predict a meaningful "average" pollutant load of stormwater runoff from a facility that adopts BMPs for the site.[72]

Second, the impediments to measuring the actual amounts of pollutants present in runoff contribute still more uncertainty to stormwater runoff controls. Because stormwater runoff is so variable over time and space, it is difficult to gauge a site's pollutant contributions through a single grab sample.[73] Indeed, monitors would need to take almost continuous samples of the runoff whenever it rained because of fluctuations in pollutant loadings over the course of a storm event.[74] Yet the costs of this type of monitoring could be substantial, and since the pollution is from runoff, rather than industrial effluent, the regulated owners and facilities may be less prepared to absorb these additional costs or pass them on to customers in the form of their products or services.[75] Monitoring runoff is thus less practicable than monitoring effluent from an industrial facility and adds further uncertainties to the evaluation of how well BMPs and other site controls are working.

The asymmetries in information regarding the types of pollutants in stormwater runoff appear roughly the same as the asymmetries in information regarding industrial effluent. The owner or operator of a parcel of land has the best and perhaps the only access to information on the extent to which the land has been disturbed, the types of sealant used on the asphalt, the materials that have been disposed of on the land, and other activities that could affect the pollutants in runoff. The owners, in other words, enjoy asymmetrical information or at least superior

[71] *See generally id.* at 4-2 (recognizing the impact of related variables on accurate BMP monitoring).

[72] *See generally* EPA, THE USE OF BEST MANAGEMENT PRACTICES, *supra* note 67, at 4-2 (providing that "a wide variety of underlying conditions may exist, making a one-size-fits-all approach to BMP monitoring infeasible").

[73] *See, e.g.*, EPA, THE USE OF BEST MANAGEMENT PRACTICES, *supra* note 67, at 4-2; EPA, OFFICE OF RESEARCH AND DEVELOPMENT, EPA/625/R-93/004, HANDBOOK: URBAN RUNOFF POLLUTION PREVENTION AND CONTROL PLANNING, ch. 5 (Sept. 1993), *available at* http://www.epa.gov/ORD/NRMRL/pubs/625r93004/625r93004.pdf [hereinafter EPA, HANDBOOK].

[74] *See generally* EPA, THE USE OF BEST MANAGEMENT PRACTICES, *supra* note 67, at 4-2 (suggesting that the "temporal and spacial variation concerning stormwater pollutant loads" complicates collection to the degree that multiple grabs may be necessary in order to ensure accuracy of BMPs).

[75] *Cf.* Chris A. Mattison, *New Storm Water Regulations Affect Municipalities and Smaller Construction Operations*, 29 COLO. LAW. 71, 75 (Feb. 2000) (referencing the costs of compliance with federal stormwater regulations and suggesting that they might be too high for some regulated parties).

access to this information that helps characterize the nature of the pollutant loading occurring through storm runoff. The owner also best knows what it will take to minimize these releases, or at least can generally discover this information most cheaply.

Thus, in stormwater discharge control, existing asymmetries in information regarding the types of pollutants that might be released into runoff are compounded by scientific uncertainties, making it nearly impossible for the EPA to a reliable, external measure of the types of pollutants that are actually being released from the site through stormwater runoff. The inability to easily measure pollution in runoff makes it difficult to know precisely what a landowner should do differently or whether newly-installed pollution controls are working. These added uncertainties make it much more difficult to oversee private owners' contributions to runoff pollution.

2. The Federal Stormwater NPDES Program

Despite the scientific differences between regulating industrial effluent discharged from a factory and the stormwater discharge that collects from a street, an industrial lot, or a construction site, the Clean Water Act (and the EPA) generally treats them the same.[76] This similar treatment of industrial and stormwater discharges is in part a historical/legal artifact: both types of discharges often occur through "discrete conveyances" and thus fall legally into the same regulatory category of "point sources."[77] This similar treatment is also the likely result of convenience. The NPDES system is well-established and has been relatively successful; therefore, sweeping one more type of pipe within this system leads to the least amount of political backlash and bureaucratic upheaval.

[76] *See generally* 33 U.S.C. § 1342(p) (2000).

[77] *See, e.g.*, Natural Res. Def. Council, Inc. v. Costle, 568 F.2d 1369, 1372 (D.C. Cir. 1977).

**Figure 1: A Step-by-Step Comparison of the NPDES Industrial Effluent Program with the NPDES Stormwater Program**

| | **Traditional NPDES Program Governing Industrial Effluent** | **Stormwater NPDES Program** |
|---|---|---|
| **Step 1: Identify Regulated Sources** | Legally covered sources self-identify and insert themselves in the system. | Legally covered sources self-identify and insert themselves in the system. |
| **Step 2: Identify Compliance Requirements** | Numeric effluent limits are promulgated in the C.F.R. | Sources identify best management practices for their sites and develop plans that describe how they will establish and maintain the practices. |
| **Step 3: Self-Monitor to Ensure Compliance** | Sources must self-monitor their effluent regularly, if not continuously, and submit results to the agency in the form of monthly discharge monitoring reports. | Sources self-monitor their compliance by conducting periodic onsite inspections and keeping records of those inspections. In some cases, self-monitoring includes sampling runoff annually or quarterly, but the discharger enjoys considerable discretion in sampling. |

In practice, however, merging the two programs has caused the EPA to force-fit stormwater regulation into the industrial effluent model. Rather than identifying the obvious differences in the scientific uncertainties between these two pollution programs and coming up with new approaches that circumvent the added uncertainties that afflict stormwater, the EPA applies the old NPDES model to stormwater runoff in cookie-cutter fashion.[78] When extending the NPDES model to stormwater runoff requires adjustments, the EPA reaches for the most obvious analog, without any apparent awareness of the added information constraints that arise in its modified program.

As Figure 1 shows, the stormwater NPDES program tracks the traditional industrial effluent NPDES program step-by-step, despite the significant differences between the information constraints that afflict the programs.[79] First, like its industrial effluent prototype, the stormwater NPDES program lists a number of "covered" sources that are officially included in the program and expects these sources to self-identify themselves and apply

[78] *See supra* Figure 1.
[79] *See supra* Figure 1.

for a permit.[80] The EPA's federal stormwater discharge program is divided into two phases that encompass increasingly smaller sources of stormwater discharges.[81] The first phase—finalized in 1990—regulates stormwater discharges from ten types of industrial operations (this include*s* the entire manufacturing sector), construction occurring on more than five acres, and medium or large storm sewers in areas that serve more than 100,000 people.[82] The second phase—finalized in 1995—includes smaller municipal storm sewer systems and smaller construction sites (down to one acre).[83] If these covered sources fail to apply for a permit, they are in violation of the Clean Water Act.[84] Because the sources are smaller and more diverse, however, the stormwater permit process is far more convoluted and sprawling than the NPDES program governing industrial effluent—a feature that might prevent some stormwater sources from understanding their legal obligation to apply for a permit.[85] See Figure 2.[86]

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[80] U.S. GOVERNMENT ACCOUNTABILITY OFFICE, GAO-05-240, STORM WATER POLLUTION: INFORMATION NEEDED ON THE IMPLICATIONS OF PERMITTING OIL AND GAS CONSTRUCTION ACTIVITIES 6–7 (Feb. 2005), *available at* http://www.gao.gov/new.items/d05240.pdf [hereinafter GAO, STORM WATER POLLUTION].

[81] National Pollution Discharge Elimination System Permit Application Regulations for Storm Water Discharges, 55 Fed. Reg. 47,990 (Nov. 16, 1990) (codified at 40 C.F.R. pts. 122–24 (1990)) (promulgating phase I regulations); Amendment to Requirements for National Pollutant Discharge Eliminating System (NPDES) Permits for Storm Water Discharges Under Section 402(p)(6) of the Clean Water Act, 60 Fed. Reg. 40,230 (Aug. 7, 1995) (codified at 40 C.F.R. pts. 122, 124 (1995) (promulgating phase II regulations).

[82] *See, e.g.,* 40 C.F.R. § 122.26(a)(3) (1990); 40 C.F.R. § 122.26 (b)(14) (1990).

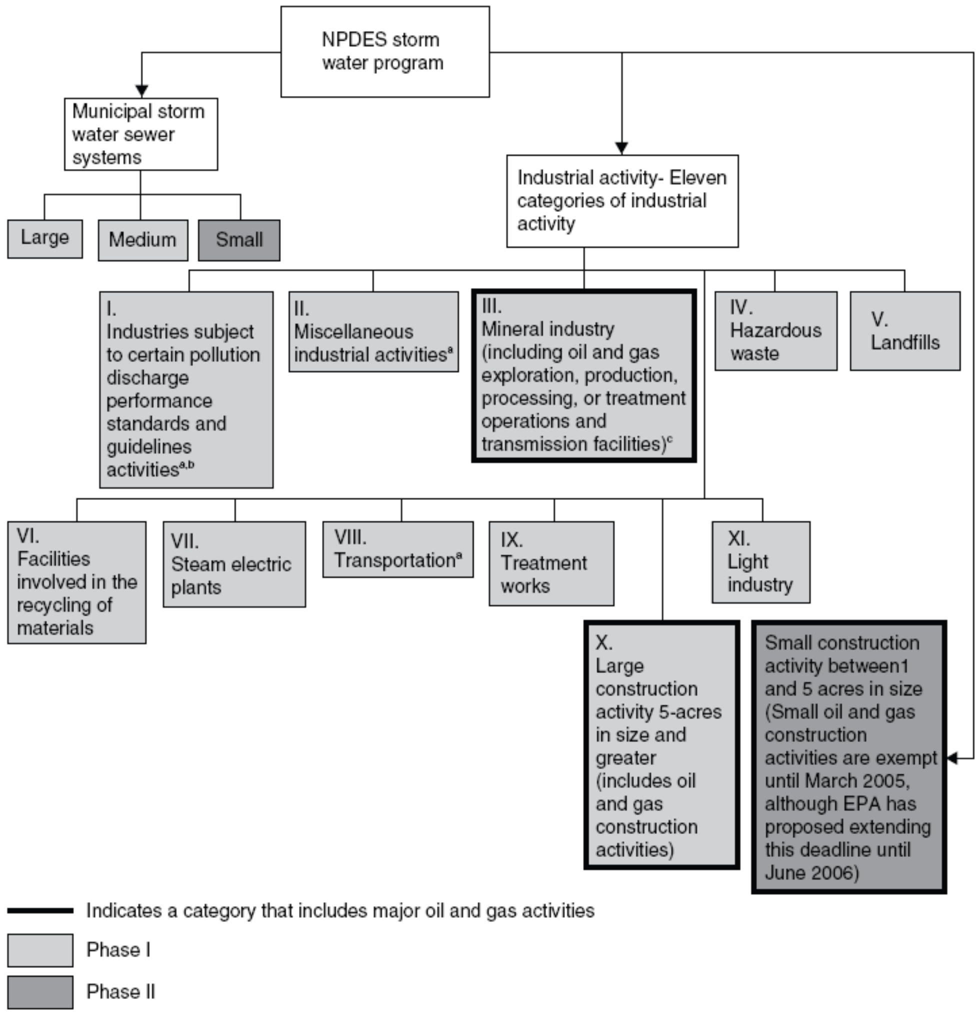
[83] *See generally* Amendment to Requirements for National Pollutant Discharge Eliminating System (NPDES) Permits for Storm Water Discharges Under Section 402(p)(6) of the Clean Water Act, 60 Fed. Reg. 40,230 (Aug. 7, 1995) (codified at 40 C.F.R. pts. 122, 124 (1995)).

[84] GAO, ENVIRONMENTAL ENFORCEMENT, *supra* note 55, at 12.

[85] 33 U.S.C. § 1342 (a)(1) (2000).

[86] GAO, STORM WATER POLLUTION, *supra* note 80, at 11.

**Figure 2: Activities Covered under Phase I and II of the NPDES Storm Water Program**




Source: GAO analysis of EPA documentation.

[a]Industry categories I, II, and VIII also include some minor oil and gas activities: I includes petroleum refining, II includes petroleum products, and VIII includes bulk stations and terminals.

[b]Facilities subject to storm water effluent limitations guidelines, new source performance standards, or toxic pollutant effluent standards under 40 C.F.R. subchapter N.

[c]Oil and gas site operators must obtain storm water permit coverage if their storm water discharges come into contact with raw material or product of any kind.

U.S. Government Accountability Office, GAO-05-240, Storm Water Pollution: Information Needed on the Implications of Permitting Oil and Gas Construction Activities 11 (Feb. 2005), *available at* http://www.gao.gov/new.items/d05240.pdf.

Second, in an attempt to develop a close analog to the numerical effluent requirements in the industrial effluent NPDES program, stormwater NPDES permits also identify compliance requirements, although these almost always take the form of site controls and other narrative, rather than numerical requirements.[87] In the stormwater program, each of the three different types of sources of stormwater discharges—construction, municipal, and industry—are required to adopt a series of BMPs or the equivalent to minimize the runoff of pollutants on site in order to be in compliance with the permit system.[88] Because of sampling difficulties, numerical effluent limits for the runoff are the exception rather than the rule in stormwater permits.[89] Even for degraded waters subject to TMDLs, any added monitoring that might be required for stormwater runoff may provide only limited information because sampling is restricted to the pollutants that cause the segment to degrade.[90] Although multiple types of permits are available, in most situations, stormwater sources avail themselves of a more flexible, "general" permit option.[91] Along with their general permit application, the discharger submits its Storm Water Pollution Prevention Plan (SWPPP) that identifies sources of pollution on site and identifies the BMPs that it will install and maintain.[92] In selecting BMPs, the discharger selects from a menu of options devised by the EPA or, in some cases, the states or locales for their particular facility.[93] For example, the regulated party will generally identify structural BMPs, such as fences and impoundments that minimize runoff, and describe how they will be installed.[94] The Plan must also include nonstructural BMPs, like good housekeeping practices, that require the source to manage the site in a way to minimize the opportunity for pollutants to be exposed to stormwater runoff.[95] This Plan and the accompanying BMPs constitute the compliance requirements for the stormwater discharger and is essentially the analog to the numeric effluent limits listed

[87] 33 U.S.C. § 1342(a)(1) (2000).

[88] *See generally* EPA, OVERVIEW OF THE STORMWATER PROGRAM, *supra* note 2, at 1–4.

[89] *See id.* at 1.

[90] *See* 40 C.F.R. §§ 420.32-420.36 (2004).

[91] Bonni Kaufman, Lawrence R. Liebesman & Rafe Peterseen, *Regulation of Stormwater Pollution: An Area of Increasing Importance to the Construction Industry*, MONDAQ BUSINESS BRIEFING, Oct. 14, 2005, *available at* http://www.mondaq.com/article.asp?articleid=35276&lastestnews=1; EPA, OVERVIEW OF THE STORMWATER PROGRAM, *supra* note 2, at IV-1.

[92] *See, e.g.,* EPA, OVERVIEW OF THE STORMWATER PROGRAM, *supra* note 2, at IV-3; EPA, 2006 MSGP, *supra* note 3, at 11.

[93] EPA, 2006 MSGP, *supra* note 3, at 15.

[94] *See, e.g.,* EPA, THE USE OF BEST MANAGEMENT PRACTICES, *supra* note 67, at 5-4 to 5-5.

[95] *See, e.g.*, Kaufman et al., *supra* note 91.

for industrial effluents in the Code of Federal Regulations.[96]

Third and even more different from the industrial effluent permits is the EPA's struggle to develop an analog for the vital self-monitoring requirement. In contrast to the end-of-the-pipe monitor installed for sampling industrial effluent, there is simply no easy or straightforward way to develop a self-monitoring system for sampling stormwater runoff.[97] Rather than depart from the traditional NPDES model and develop some different method for externally measuring runoff or permittee compliance, the EPA requires facilities to continue to "self-monitor" through periodic onsite inspections that are documented in the companies' onsite records.[98] Typically, general stormwater discharge permits do not require any quantitative monitoring of runoff to test the effectiveness of site controls.[99] Instead, only a subset of dischargers are actually required to take samples and an even smaller subset of those sources must actually take quantitative samples (as opposed to visual samples); moreover, as described in detail below, the permittee enjoys discretion in when and how to sample.[100]

### B. Implementation of the Stormwater Discharge Program: Running Face-first into the Information Constraints

On its face, the extension of the industrial effluent NPDES permit system to stormwater sources is a logical one: Like an operating industry, the stormwater source must "do their best" to minimize the runoff of pollutants into drains and self-monitor their own compliance with these "do your best [management practices]" commitments.[101] But under the surface, there are dramatic differences between these two parallel permit systems, especially with regard to the information available to regulators who oversee compliance. Under the traditional NPDES permit system, the regulator overcomes the regulated party's superior access to information by specifying the regulatory requirements with precision and requiring the source to install monitors that take samples at regular intervals.[102] Although some cheating still takes place, this system overcomes asymmetrical information problems with respect to compliance by instituting a moni-

[96] 40 C.F.R. §§ 420–471.106 (2004).

[97] *See generally* EPA, THE USE OF BEST MANAGEMENT PRACTICES, *supra* note 67, at 5-20 to 5-21.

[98] *See, e.g.*, EPA, 2006 MSGP, *supra* note 3, at 21–22; EPA, OVERVIEW OF THE STORMWATER PROGRAM, *supra* note 2, at IV-4.

[99] *See, e.g.,* EPA, OVERVIEW OF THE STORMWATER PROGRAM, *supra* note 2, at 3.

[100] *See* EPA, NPDES, *supra* note 3, at §§ 3.2.6.1, 3.2.6.2.

[101] *See id.* at 15.

[102] 33 U.S.C.A. § 1314 (2000).

toring or oversight system that provides almost no operator discretion.[103]

Stormwater permits attempt to adopt similar requirements in keeping with the NPDES prototype, but the added scientific uncertainties of stormwater runoff do not allow for easy analogs. As a result, there are three vital differences in implementation of the stormwater NPDES program that leave much superior information, and hence compliance discretion with the discharger. First, unlike industrial pipes that carry wastes from their factories out to receiving waters, the physical presence of covered stormwater discharge sources is less visible or obvious. Thus, particularly for some industrial and construction sources, if a stormwater source does not self-report and apply for a permit, the probability of detecting it is much lower than the traditional NPDES permit system. The second major difference is the permittee's role in selecting the "do your best" compliance requirements.[104] The selection of BMPs and their embodiment in a larger pollution prevention plan can introduce ambiguity into the requirements if the permittee is clever about drafting the requirements in general terms. Third and most importantly, there are only loose self-monitoring requirements and these leave the source with considerable discretion.[105] This exacerbates the problems of asymmetrical information involved in the already ambiguous compliance requirements, leaving the regulator even more handicapped in ensuring compliance and the regulated source less concerned about the possibility of meaningful enforcement. Each of these challenges is elaborated in detail below.

1. Identifying Stormwater Sources in Need of Permitting

Both the NPDES industrial and stormwater programs depend on the regulated party to self-report their existence and apply for a permit.[106] The failure of sources to self-identify has been a problem that has plagued industrial effluent regulation; however, the problem may be far worse for some stormwater sources, particularly from industrial and construction sites that can be more obscure. As long as there is a low probability of regulators identifying and catching stormwater sources compared to sources of industrial effluent, then compliance with the stormwater NPDES program can be expected to be lower than compliance with the industrial NPDES program. For a number of stormwater sources—construction being the most notorious—one can ex-

[103] *Id.*
[104] *See* EPA, 2006 MSGP, *supra* note 3, at 15.
[105] *See id.*
[106] 33 U.S.C. § 1318 (2000).

pect a great deal of slippage to occur between those sources who should be covered by a permit and those who actually make the effort to apply.

Evidence suggests that many industrial and construction stormwater sources are failing to self-report and hence remain unpermitted and unregulated.[107] In Maine, less than twenty percent of the stormwater sources that fall within the regulatory jurisdiction of the federal stormwater program actually applied for permits before 2005—more than a decade after the federal regulations were promulgated.[108] Yet there is no record of enforcement action taken by Maine against the unpermitted sources during that interim period.[109] Indeed, in the one enforcement action brought by citizens in Maine for an unpermitted discharge, the source claimed ignorance of the stormwater program.[110] In Washington, the state Department of Ecology speculates that between ten and twenty-five percent of all businesses covered by the federal stormwater permit program are actually permitted.[111]

In response to this problem, the EPA appears to be targeting enforcement against stormwater sources that do not have permits. In several cases, the EPA pursued regulated industries that failed to apply for stormwater permits.[112] The EPA has also brought enforcement actions against at least three construction companies for failing to apply for a stormwater permit for their construction runoff.[113] Such enforcement actions help to make the stormwater program more visible and give the appearance of a higher probability of enforcement associated with noncompliance. Nevertheless, the non-intuitive features of needing a permit to discharge stormwater, coupled with a rational perception of a low probability of being caught, likely encourage some

[107] There is also evidence of creative compliance to avoid triggering the permit requirements. In a study by the GAO of the implications of the stormwater NPDES permit program for oil and gas construction activities, one facility conceded that it actually broke their operations into smaller sites to avoid triggering the five acre minimum for Phase I construction stormwater permit requirements. *See, e.g.*, GAO, STORM WATER POLLUTION, *supra* note 80, at 13-14.

[108] *See* John Richardson, *Maine Makes it Clear: Watch your Stormwater; Businesses are Being Warned About Meeting the Rules on Polluted Runoff,* PORTLAND PRESS HERALD, Nov. 28, 2005, at A1 (in Maine, 330 businesses applied for stormwater permits in the state; approximately 1500 facilities in the state are likely to be covered by that program).

[109] *Id.*

[110] *Id.*

[111] Robert McClure, *Stormwater Bill Raises Concern*, SEATTLE POST-INTELLIGENCER, Feb. 25, 2004, at B1.

[112] *See, e.g.,* Press Release, EPA, EPA Orders Oakland Facility to Comply with its Stormwater Permit, (June 22, 2005) (on file with Chapman Law Review); Kaufman, et al., *supra* note 91.

[113] *See* Press Release, EPA, Three NH Companies Agree to Pay Fine to Settle EPA Complaint; Case is Part of EPA Push to Improve Compliance with Stormwater Regulations (Aug. 10, 2004) (on file with Chapman Law Review).

sources to fail to enter the system at all.

2. Prescribing Compliance requirements

In contrast to the numerical limits listed in the Code of Federal Regulations for industrial effluent, stormwater sources design their own pollution plan for minimizing pollutants in their stormwater runoff.[114] This involves two steps, both of which can involve significant amounts of discretion that favor the regulated party.

First, the source must evaluate the site for problematic pollutants; but where the regulated party does not have specific knowledge or data, they need only offer "estimates" and "predictions" of the types of pollutants that might be present at the site.[115] See Figure 3. These requirements are unlikely to lead regulated parties to rise to the occasion of conducting a rigorous site assessment. Instead, these types of nebulous informational demands leave regulated parties with incentives to avoid expensive sampling that will only have the potential to increase their compliance obligations. With the exception of visible features, the deferential site investigation requirements, paired with the parties' asymmetrical access to information, allow them to describe site conditions in ways that largely escape accountability. Given this discretion, ignorance regarding the site conditions will generally be bliss.

[114] *See generally* EPA, 2006 MSGP, *supra* note 3, at 15.

[115] *See* EPA, OVERVIEW OF THE STORMWATER PROGRAM, *supra* note 2, at IV-3, V-3; *supra* Figure 3.

**Figure 3: EPA's Required Description of the Site**

The description of potential pollutant sources must include:

- A map of the facility indicating the areas which drain to each storm water discharge point
- An indication of the industrial activities which occur in each drainage area
- A prediction of the pollutants which are likely to be present in the storm water
- A description of the likely sources of pollutants from the site
- An inventory of materials that may be exposed to storm water
- The history of spills and leaks of toxic or hazardous materials for the last three years.

The measures and controls to prevent or minimize pollution of storm water must include:

- Good housekeeping or upkeep of industrial areas exposed to storm water
- Preventative maintenance of storm water controls and other facility equipment
- Spill prevention and response procedures to minimize the potential for and the impact of spills
- Test all outfalls to ensure that there are no illicit discharges
- Training of employees on pollution prevention measures and controls, and record keeping.

The permit also requires that facilities:

- Identify areas with a high potential for erosion and the stabilization measures or structural controls to be used to limit erosion in these areas
- Implement traditional storm water management measures (oil/water separators, vegetative swales, detention ponds, etc.) where they are appropriate for the site.

Quoted in EPA, EPA 833-R-96-008, OVERVIEW OF THE STORMWATER PROGRAM, IV-3 to IV-4 (June 1996) (summarizing applicable regulatory requirements), *available at* http://www.epa.gov/npdes/pubs/owm0195.pdf.

Second, sources must then develop a pollution prevention plan that best accomplishes reductions in pollutant loads at that particular site, a role that again allows them to capitalize on their asymmetric information.[116] See Figure 4. In this setting, a rational actor can be expected to choose BMPs and develop a pollution prevention plan that is as inexpensive as possible with the lowest amount of maintenance and oversight, rather than a plan that is especially effective at reducing polluted runoff. Despite the EPA's instructions to consider a laundry list of considerations that will help the facility settle on the most effective pollution plan,[117] regulated parties are likely to look harder at the cost side

[116] *See, e.g.,* EPA, OVERVIEW OF THE STORMWATER PROGRAM, *supra* note 2, at IV-3; *infra* Figure 4.

[117] *See, e.g.,* EPA, 2006 MSGP, *supra* note 3, at 20.

of the ledger in determining how to design their compliance obligations. Indeed, there are no obvious benefits or extra credit for particularly vigorous or effective plans. Unless the source can figure out a way to eliminate all pollutant threats and be eligible for a "no exposure" waiver,[118] their extra effort will be unrewarded and unnoticed. In such a setting, doing the bare minimum is the most rational response.

**Figure 4: EPA's BMP Identification Requirements**

Plans are required to contain a description of the controls and measures to prevent or minimize pollution of storm water and a specific schedule with interim milestones as to when measures and controls will be implemented. The measures and controls to prevent and minimize pollution of storm water must include:

- Good housekeeping in industrial areas exposed to storm water
- Preventative maintenance of storm water controls and other facility equipment
- Spill prevention and response procedures to minimize the potential for and the impact of
- Training of employees on pollution prevention measures and record keeping
- Identification of areas with a high potential for erosion and the stabilization measures or structural controls to be used to limit erosion
- Implementation of traditional storm water management measures (oil/water separators, vegetative swales, detention ponds, etc.) where they are appropriate for the site.

Quoted in EPA, EPA 833-R-96-008, OVERVIEW OF THE STORMWATER PROGRAM, VI-4 (June 1996) (summarizing applicable regulatory requirements), *available at* http://www.epa.gov/npdes/pubs/owm0195.pdf.

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[118] *See* 40 C.F.R. § 122.26(g) (2004).

In developing the terms of their pollution prevention plan, rational facilities are more likely to develop ambiguous compliance requirements that leave them with discretion in determining compliance.[119] Rather than require sampling and measurements of pollutants on-site, "routine" or "regularly scheduled" visual inspections will be preferred.[120] These types of wishy-washy standards allow regulated parties to argue that they are in compliance in the unlikely event that the one regulator in the state assigned to stormwater runoff actually conducts a site investigation.[121]

The EPA does not anticipate or make much effort to curb this rational choice behavior by sources to maximize their compliance discretion. Instead, the EPA describes many of the permit requirements in general terms that afford even greater discretion to regulated parties. For example, the EPA commands the regulated party to "implement any additional BMPs that are economically reasonable and appropriate in light of current industry practice, and are necessary to eliminate or reduce pollutants in . . . stormwater discharges."[122] In instructing dischargers on the trigger events that require them to update their pollution plans, the EPA similarly provides "loophole" terms that allow many sources to escape this responsibility simply by interpreting the ambiguous terms broadly:

> You must review, and amend your SWPPP as *appropriate* whenever there is: construction or a change in design, operation or maintenance at your facility such that these situations have a *significant impact* on the discharge, or potential for discharge, of pollutants from your facility; [or] whenever *your routine inspection or compliance evaluation* determines deficiencies in your BMPs . . . .[123]

Perhaps to make its requirement nevertheless appear rigid, the EPA then demands that these modifications to SWPPPs "must be made within 14 calendar days after discovery, observation or event requiring a SWPPP modification."[124] So the facility has relatively free reign—aside from obvious disasters—to decide

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[119] Facility operators, in preparing a SWPPP, "must include [BMPs], economically reasonable and appropriate in light of current industry practices, that are selected, designed, installed, implemented and maintained in accordance with good engineering practices to eliminate or reduce all pollutants in [their] discharge . . . ." Such language gives facility operators flexibility wide latitude in determining compliance. *See, e.g.,* EPA, NPDES, *supra* note 3, at 15.

[120] *Id.* at 20, 132.

[121] *See infra* note 147 and accompanying text.

[122] *See, e.g.,* EPA, 2006 MSGP, *supra* note 3, at 23.

[123] *Id.* at 24 (emphasis added).

[124] *Id.*

when to update the plan, but once it makes this decision to update, it must do so in fourteen days.

The extent of regulator oversight in reviewing these pollution plans is also likely to vary tremendously, providing still more room for permittee discretion in locales where regulatory review is limited.[125] In states or locales where the interest or administrative resources are low, the regulator is likely to only review the facial adequacy of the plan and not conduct a corresponding site investigation.[126] Therefore, if problems are not addressed by the facility in their plan, pollution problems may never be redressed or caught at all by the EPA, state, or local agencies. Due to the source's asymmetrical information in preparing the plan, a regulator is substantially handicapped in ensuring that the plan captures the "best" that the source can do in terms of management practices.

Allowing regulated parties who enjoy private advantages in accessing information to both identify the problems and implement what they believe is the best solution, without clear external measures of accountability, erects a regulatory system that creates perverse incentives for ignorance and keeps regulated parties largely unaccountable to regulators and the public. Only regulated parties will know if the potential sources of pollution on their facility have been adequately identified.[127] Only they will know whether the plan provides the best way to address these problems, and they will have far more access to information to determine their own compliance with the plan. Finally, to the extent that there is much discretion in determining compliance, they will enjoy the role of arbiter.

Conversely, if the regulated party invests resources measuring pollutant loads on their property, they are creating a paper trail that puts them at risk of greater regulation. Under the EPA's regulations, a regulated party "must provide a summary of existing stormwater discharge sampling data previously taken at [its] facility," but if there are no data or sampling efforts, then

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[125] Currently, the public is generally not involved in the review of a facility's SWPPP and there is no formal opportunity for public participation. *See, e.g.*, Caltrans, *Water Quality NewsFlash* (Sept. 26, 2005), *available at* http://www.dot.ca.gov/hq/env/stormwater/publicat/newsflash/9_26_05.pdf (discussing the potential effect of recent U.S. appellate decisions on current stormwater permit practice, which is not to provide the public with an opportunity to review SWPPPs).

[126] *But see* Kaufman et al., *supra* note 91 (suggesting the EPA is encouraging the states to conduct their own investigations).

[127] The regulated party is expected to identify these problems, but there is no check on the amount of effort they use to inventory possible problems or whether they err on the side or over- or under-inclusiveness in this estimation. *See, e.g.*, EPA, 2006 MSGP, *supra* note 3, at 18.

the facility is off the hook.[128] Quantitative measures can be incriminating, particularly in a regulatory setting where the regulator is willing to settle for estimates. Real data documenting problems provides regulators with evidence that there may be problematic sources of pollutants in stormwater runoff, leading them to insist on more controls than for a comparable, unsampled site.[129]

3. Ensuring Compliance

The regulated party is also responsible for self-monitoring its compliance.[130] But unlike the NPDES program where there are quantitative measures of compliance, the self-inspections and self-monitoring requirements are general and leave much greater discretion that favor the regulated party.[131]

As part of their pollution plan, all stormwater sources are required to self-inspect their facilities,[132] but like the discretion afforded to them in most other aspects of devising these plans, the inspection requirements are also ambiguous and quite deferential.[133] See Figure 5. Sources are required to keep records of the inspections, but this appears to be the outer limit of their accountability for these inspections.[134] Short of having a compliance officer visit the site, there is effectively no way to ensure that the regulated party is complying with their BMPs and other regulatory requirements in a rigorous way.[135] As a result, in the current design of the stormwater program, a regulated source can do a poor job implementing BMPs without much, if any, accountability. For example, if a source is supposed to build a silt-fence as required by their pollution prevention plan, there is little to keep them from building one that meets only the minimum requirements. During the ensuing years as the fence deteriorates, the fact that it is still standing might be counted by the source as adequate for purposes of complying with its stormwater pollution prevention plan.[136]

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[128] *See, e.g., id.* at 20; *see also* EPA, OVERVIEW OF THE STORMWATER PROGRAM, *supra* note 2, at V-2 (showing same requirement for construction permit).

[129] *See generally* Kaufman et al., *supra* note 91 (indicating that the EPA is now cracking down on companies that have not obtained permits).

[130] EPA, 2006 MSGP, *supra* note 3, at 24.

[131] *Compare* 33 U.S.C. § 1342(a)(2)-(b)(2) (2000) (outlining requirements for compliance under NPDES) *with* EPA, 2006 MSGP, *supra* note 3, at 26 (outlining requirements for self-compliance under EPA regulations).

[132] *See, e.g.,* EPA, 2006 MSGP, *supra* note 3, at 21.

[133] EPA, OVERVIEW OF THE STORMWATER PROGRAM, *supra* note 2, at IV-4; *see supra* Figure 5.

[134] *See, e.g.,* EPA, 2006 MSGP, *supra* note 3, at 22.

[135] *See generally id.* at 21–22 (illustrating the lax requirements of self-inspection and employee training of inspection teams).

[136] *Cf.* Kaufman et al., *supra* note 91 ("For example, a silt fence that sags for several

**Figure 5: EPA's Inspection/Site Compliance Evaluation Requirements**

Facility personnel must inspect the plant equipment and industrial areas on a regular basis. At least once a year or more a thorough site compliance evaluation must be performed by facility personnel. Personnel conducting the evaluation shall:

- Look for evidence of, or the potential for, pollutants entering the drainage system
- Evaluate the performance of pollution prevention measures
- Revise the pollution prevention plan based on the results of the evaluation in order to reduce
- the discharge of pollutants
- Document both the routine inspections and the annual site compliance evaluation in a report.

Quoted in EPA, EPA 833-R-96-008, OVERVIEW OF THE STORMWATER PROGRAM, IV-4 (June 1996) (summarizing applicable regulatory requirements), *available at* http://www.epa.gov/npdes/pubs/owm0195.pdf.

Federal regulations do supplement these self-inspections with sampling requirements for a subset of sources, yet even these more data-driven requirements still leave regulated parties with some discretion.[137] Most industrial facilities, for example, are required to conduct a visual inspection of a grab sample of their stormwater runoff on a quarterly basis and describe the visual appearance of the sample in a document that is kept on file at the site.[138] Certainly, a visual sample is better than nothing, but the requirement not only allows the source some discretion in determining how and when to take the sample (explained below), but also discretion in how to describe the sample.[139] A smaller list of facilities must actually quantitatively sample listed pollutants in their stormwater runoff on a quarterly basis.[140] Yet while the EPA's sampling guidelines specify that these

days in-between inspections may be considered by [the] EPA to be a violation for each day that it is not fixed, despite the fact that under the SWPPP the fence is not required to be inspected during that several day period. Labeling such an event a permit violation (subject to up to $27,500 of fines per day) would appear inconsistent with the notion that inspections, followed by maintenance and repair of problems identified in the inspection are fundamental to BMPs.").

[137] *See, e.g.*, EPA, 2006 MSGP, *supra* note 3, at 27.

[138] *See, e.g.*, *id.* at 28; EPA, OVERVIEW OF THE STORMWATER PROGRAM, *supra* note 2, at VI-5.

[139] *See, e.g.*, EPA, 2006 MSGP, *supra* note 3, at 29 (allowing a regulated party to visually monitor just one outfall if others are believed to "discharge substantially identical effluents . . . .").

[140] *See, e.g., id.* at 93-94.

samples should be taken within thirty minutes after the storm begins, and only if it is the first storm in three days, that is the limit of the restrictions governing sampling.[141] The owner's personnel determines which storm they will use for their monitoring requirement and at which point during that first half-hour to take the grab sample.[142] This is not to suggest that owners will cheat. However, the guidelines—in some cases by necessity—provide sources with relatively wide bounds for conducting this sampling.[143] If the owners have an interest in measuring only low pollutant levels in their samples, these guidelines provide them the discretion to cherry-pick storms and, to some extent, times during which to collect the sample during a storm.[144] Although municipalities are required to do more extensive sampling of runoff and enjoy less sampling discretion,[145] even municipalities are allowed to select what they believe are their most representative outfalls for purposes of monitoring pollutant loads.

Even in cases where the party reports high pollution loads in these quarterly samples, the source is generally required only to use its discretion to amend its plan to do better.[146] Given the enormous variability in storms and stormwater runoff concentrations, even within the first thirty minutes of any storm event, it is no wonder the EPA shies away from attaching serious consequences to the results of an annual or even a quarterly grab sample of stormwater. At the same time, however, the lack of real consequences that flow from high pollutant loads transforms the already weak program into little more than a paper tiger. At the end of the day, sources only need to document the steps and requirements they have taken to comply with the guidelines, rather than employ rigorous or innovative improvements to the site that actually succeed in minimizing pollutant runoff in storm flows.[147]

Making matters worse, there appears to be very limited regulatory resources; for example, in Oregon, there is only one inspector to oversee compliance with the stormwater program.[148]

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[141] *See id.* at 33.

[142] *See id.*

[143] *See, e.g., id.* (explaining that sources are obliged to provide *general* information on the storm event *itself* when submitting their sample).

[144] *See, e.g., id.* at 33-34.

[145] *See, e.g.,* EPA, OVERVIEW OF THE STORMWATER PROGRAM, *supra* note 2, at VIII-1.

[146] *See, e.g.,* EPA, 2006 MSGP, *supra* note 3 at 10, 30, 34.

[147] *See id.* at 44.

[148] Libby Tucker, *Oregon and Washington to Release Tougher Standards for Stormwater Permits*, DAILY J. COMMERCE (Portland, Or.), Dec. 12, 2005, at 2 (reporting that Oregon's Department of Environmental Quality only has "one full-time employee inspecting the 1,500 [stormwater] sites under permit . . . ."); McClure, *supra* note 111, at B1 (re-

And yet even with considerable regulatory resources dedicated to stormwater source inspections, it is not clear how well inspectors could independently assess compliance with the permit requirements. For example, some of the plan's requirements will specify "good housekeeping" practices that should take place routinely at the facility from day-to-day.[149] Whether or how well these practices are followed cannot be assessed in a single inspection. While a particularly non-compliant facility might be apparent from a brief, one-shot visual inspection, a facility that is mildly sloppy, or at least has periods during which it is not careful, can escape detection on one of these pre-announced audits. Facilities also know best the pollutants they generate and how or whether those pollutants might make contact with stormwater. Inspectors might be able to notice some of these problems, but because they do not have the same level of information about the operations of the facility, they can be expected to miss some problems.

A final compliance concern—which goes both to the facility's incentives to be in compliance as well as to the realities of enforcement in terms of the probability of being caught in violation—is the seeming impossibility of using citizen suits to enforce stormwater permit requirements. To the extent that states and locales do not oversee stormwater permit programs with vigor, citizens may be the only realistic hope of providing some meaningful enforcement to the program. Citizens have, in fact, sued facilities for unpermitted stormwater discharges:[150] this is a straightforward process because citizens need only verify that the facility is covered and lacks a permit.[151] Overseeing facility compliance with stormwater permit requirements is a different story, however, and citizens are stymied at this stage of ensuring facility compliance. Citizens can access a facility's pollution prevention plan, but only if they request the plan from the facility in writing.[152] Moreover, the facility is given the authority to make a determination—apparently without regulator oversight—of whether the plan contains confidential business information and thus cannot be disclosed to citizens.[153] But, even if the facility

porting that state employees available to inspect stormwater discharges in Washington are "thin"). *But see* California EPA, California Water Boards, ENFORCEMENT REPORT, Feb. 23, 2005, at 11, 13-14, *available at* http://www.waterboards.ca.gov/legislative/docs/2004/enforcementrpt2004_13385o.pdf (outlining considerable enforcement activity under the stormwater discharge program).

[149] *See supra* Part II.A.2.

[150] *See, e.g.,* Richardson, *supra* note 108, at A1.

[151] *See* 33 U.S.C. § 1365 (2000).

[152] *See, e.g.,* EPA, 2006 MSGP, *supra* note 3, at 25; *see also supra* note 125 (noting how citizens do not have a formal opportunity to review the adequacy of facilities' SWPPPs).

[153] *Id.* at 26.

sends the plan to the citizens, it will be nearly impossible for them to independently assess whether the facility is in compliance unless the citizens station telescopes, conduct air surveillance of the site, or are allowed to access the facility's records of its own self-inspections.[154] Moreover, to the extent that the stormwater outfalls are on the facility's property, citizens might not be able to conduct their own sampling without trespassing. In any event, and as mentioned above, the permit requirements are so flexible that an arguably large range of activities with tremendously variable impacts on water quality are allowed under existing permit requirements. Thus, renting telescopes would not be worth the trouble because the facility could likely argue that its small eroding impoundment basin is nevertheless a functioning basin as that term is specified in the general menu of BMPs. In most cases, then, the disputes will ultimately devolve to arguments about whether the facility has complied with the minimum recordkeeping requirements in these settings, the facility will not only have private information to assist them in defending their compliance, but may be able to deprive the citizens of standing if they can amend their records after the fact.[155]

## III. REFORM

The federal stormwater NPDES program is a disappointment. Despite its extravagant wrappings, underneath the links, guidance documents, and studies is a program that is designed in a way that does not seem cognizant of existing information problems and that could exacerbate the tendency of owners to keep information to themselves.

Reforming this program requires acknowledging the unique information constraints that afflict it. Such a reform does not require scrapping the existing program, but would involve designing and implementing controls in ways that confront and overcome some of the existing asymmetries in information.

In this section, three possibilities for reform—some more promising than others—are considered.

### A. The Role of State and Local Governments

Because it requires controls on land use, the EPA's stormwater discharge program strikes at a target that is traditionally

[154] *Cf.* Dow Chemical Co. v. United States, 476 U.S. 227 (1986) (holding that aerial surveillance by the government does not violate the Fourth Amendment).

[155] *Cf.* Steel Co. v. Citizens for Better Env't, 523 U.S. 83, 102–03 (1998) (finding that the relief sought would not redress losses caused by steel manufacturer's violations and therefore, the plaintiff "failed to satisfy redressability requirement for standing").

within the province of state and even more likely local government regulation.[156] Indeed, it is possible that part of the reason for the EPA's loosely structured permit program is its concern about intruding on the province of state and local governments, particularly given their superior expertise in regulating land use practices.

In theory, it is perfectly plausible that some state and local governments will step into the void and overcome some of the information problems built into the design of the federal stormwater discharge program. If local or state governments required mandatory monitoring or more rigorous and less ambiguous BMPs, they would make considerable progress in developing a more successful stormwater control program. In fact, some states and locales have instituted programs that take these steps and began to confront and overcome the problems of asymmetrical and uncertain information more directly. For example, California appears to lead all other states in aggressive stormwater discharge programs, including implementing greatly expanded monitoring requirements.[157] Municipalities are also blazing new trails.[158] Notably, Stafford, New Jersey uses innovative municipal stormwater systems that filter the runoff before discharging it back into aquifers.[159] Another town in Michigan is developing cutting-edge techniques for tracking illicit connections into the municipal stormwater system.[160]

Despite these bursts of enthusiasm, most state, local governments and business communities have not been receptive to regulating stormwater discharges; therefore, it is unlikely that they will take action to repair the EPA's failing federal pro-

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[156] *See* A. Dan Tarlock, *Contested Landscapes and Local Voice,* 3 WASH. U. J.L. & POL'Y 513, 526 (2000) (discussing the proposition that "water law is an exclusive state function").

[157] *See, e.g.,* CALIFORNIA STATE WATER RESOURCES CONTROL BOARD, FACT SHEET FOR WATER QUALITY ORDER 99-08-DWQ, NPDES GENERAL PERMIT FOR STORMWATER STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY (GENERAL PERMIT): SAMPLING AND ANALYSIS 34, *available at* http://www.swrcb.ca.gov/stormwtr/docs/9908_factsheet.doc (last visited Feb. 13, 2006). The States of Washington and Maryland also have aggressive programs. *See, e.g.*, Washington Department of Ecology, Water Quality Program, Stormwater, http://www.ecy.wa.gov/programs/wq/stormwater/ (last visited May 12, 2006); Maryland Department of the Environment, Maryland's Stormwater Management Program, http://www.mde.state.md.us/Programs/WaterPrograms/SedimentandStormwater/index.asp (last visited May 12, 2006).

[158] *See, e.g.,* Prince George's County, Maryland, PRD Stormwater Management Details Frequently Asked Questions, http://www.co.pg.md.us/Government/AgencyIndex/DER/PRD/stormwater_management.asp (last visited May 12, 2006).

[159] *See* Erik Larsen, *Stafford Floods Lot to Show off System,* ASBURY PARK PRESS (Asbury Park, N.J.), Mar. 6, 2004, at B1.

[160] *See* Dean C. Tuomari & Susan Thompson, *Sherlocks of Stormwater*, WATER ENV'T & TECH., May 1, 2005, at 49, *available at* 2005 WLNR 8150301.

gram.[161] Because they involve some expense, stormwater discharge requirements can increase resident taxes,[162] anger businesses,[163] and strain already busy regulatory staff.[164] The dearth of scientific evidence connecting stormwater controls with water quality improvements makes implementation of these programs seem even less compelling. The president of a builders' league in New Jersey quipped that: "[t]here's no scientific background for these regulations . . . They seem to be into junk science."[165] In any event, a fair number of states have already passed "no more stringent" laws which legislatively preclude them from taking added actions to improve on the federal stormwater program, even if they had the will to do so.[166] Local and state government disinterest in stormwater discharge regulation thus helps to explain why there are many stormwater sources out of compliance with the stormwater discharge permit program, at least in the few states that have gone on record.[167]

Interestingly, for at least some of the states and localities that have taken leadership roles in repairing the federal stormwater program, there appears to be particularly compelling water quality benefits that accrue to them that might not be available to other states or locales. Innovations in recharging municipal stormwater takes place in a New Jersey town that is adjacent to a recreational bay that was suffering from poor water quality.[168] "Sewer sleuths" traced illicit connections in a town that was attempting to transform its adjacent, degraded river into a water body fit for fishing and swimming.[169] California and cities like

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[161] *See, e.g.,* Tucker, *supra* note 148, at 2 (quoting Oregon agency staff member as saying: "'Compared to other states, we're doing pretty well as far as the requirements. No other states outside of Washington and California have monitoring in their construction permits at all . . . .'"); *Stormwater Woes Solutions Sought*, OCEAN COUNTY OBSERVER (Asbury Park, N.J.), Apr. 13, 2005, at A16 (describing lack of enthusiasm for the stormwater program in New Jersey); *SD Stormwater Runoff Rules Survive Building Industry Test*, CALIFORNIA PLANNING & DEVELOPMENT REPORT, Jan. 1, 2005, at 12 (describing unsuccessful lawsuit brought by regulated parties against the San Diego Regional Water Quality Control Board for their vigorous stormwater program that exceeds the federal floor) [hereinafter CALIFORNIA PLANNING & DEVELOPMENT REPORT].

[162] *See, e.g.*, Jacinthia Jones, *City To Assess Runoff Fee In July*, COMMERCIAL APPEAL (Memphis, Tn.), Dec. 11, 2005, at B1.

[163] *See, e.g.,* CALIFORNIA PLANNING & DEVELOPMENT REPORT, *supra* note 161, at 12.

[164] *See supra* note 148 and accompanying text.

[165] *See, e.g.,* Thomas Barlas, *New Stormwater Rules* to *Protect State Streams, McGreevey Promises,* PRESS (Atlantic City, N.J.), Jan. 6, 2004, at A8.

[166] *See generally* Andrew Hecht, *Obstacles to the Devolution of Environmental Protection: States' Self-Imposed Limitations on Rulemaking*, 15 DUKE ENVTL. L. & POL'Y F. 105 (2004) (discussing these "no more stringent" laws).

[167] *See* Richardson, *supra* note 108, at A10; McClure, *supra* note 111, at B4.

[168] *See* Jacques Cousteau National Estuarine Research Reserve, Coastal Resources Toolkit: Stormwater Management, 2. Case Study: Stafford Township, NJ, http://www.jcnerr.org/coastal_training/toolkit/storm/case-study.html (last visited Feb. 13, 2006).

[169] *See* Tuomari & Thompson, *supra* note 160, at 49–50.

San Diego, Newport Beach, and Santa Monica enjoy a great deal of tourism from their ocean frontage, making their extra efforts to control water quality largely selfish. The energies dedicated to the stormwater program by state and local governments in the aggregate, in fact, might actually be loosely correlated with localized rewards from cleaner water quality. When a state or locality does not derive direct or immediate benefits from investing resources in stormwater discharge reduction, they might be less inclined to implement an innovative stormwater program.

Despite the substantial role they could play in correcting the federal program's insensitivity to the science constraints, many states and locales do not appear to be eager to implement the stormwater discharge programs, much less make it more stringent and enforceable. This lack of enthusiasm also makes sense in rational choice terms. Stormwater discharge regulation is costly and politically unpopular.[170] If the benefits of stormwater controls are not going to materialize in waters close to or of value to the urban area, then the costs of the program from locality's standpoint are likely to outweigh its benefits. In fact, in some cases an upstream town's efforts might be perceived as benefiting only downstream neighbors who might attract away its taxpayers with lower stormwater regulation and/or a higher water quality.[171]

What is not clear is the extent to which the current federal program actually serves as a roadblock to innovative approaches at the state or local level. The elaborate paper requirements for stormwater discharge permits create an infrastructure that may ultimately displace—both in terms of effort and framing the problem—other approaches to stormwater discharge control. Indeed, the tendency of an elaborate but failed federal program to effectively preempt state innovation is a familiar problem with the Clean Water Act: it has also been raised as a problem with the EPA's obsessively methodological TMDL program.[172]

Moreover, by developing such a poor federal template for stormwater discharge regulation, the EPA may also be setting up those governments that do attempt to innovate for untoward political pressure. San Diego has already been singled out by its business community who argued that the county's more rigorous

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[170] *See, e.g.,* June F. Harrigan-Lum & Arnold L. Lum, *Hawaii's TMDL Program: Legal Requirements and Environmental Realities*, 15 NAT. RESOURCE & ENV'T 12, 61 (2000).

[171] *But see* SUZANNE DALLMAN & THOMAS PIECHOTA, LOS ANGELES & SAN GABRIEL RIVERS WATERSHED COUNCIL, STORM WATER: ASSET NOT LIABILITY (1999), *available at* http://www.lasgrwc.org/publications/Stormwater.pdf (making the case that there can be immediate benefits to some communities in removing pollutants from stormwater).

[172] *See id.* at 61–62.

implementation of the stormwater discharge permit program violated federal law because it exceeded federal standards.[173] Although they lost their lawsuit against the County of San Diego,[174] undoubtedly these businesses' discontent continues in the form of political pressure on elected officials and others responsible for implementing the stormwater program. Finally, it is possible that the extensive paper requirements give the federal program the illusion of providing a comprehensive solution to stormwater runoff problems. This regulatory mirage carries the potential to mislead the public and reduce the urgency of introducing more effective approaches to stormwater discharge controls.

### B. Mandatory, Systematic Monitoring

Given the strong asymmetries in information that the regulated facilities enjoy under the stormwater regulatory program, a rigorous water quality monitoring system that assesses the facilities' real progress in reducing stormwater discharges would be enormously beneficial, if not vital, to make the program work.[175] As described in Part II, the current federal stormwater program not only fails to require meaningful monitoring, but may actually provide disincentives for sources to conduct rigorous monitoring on their own.

Holding stormwater sources accountable for the objective results of their stormwater control efforts evidenced in monitoring results, rather than their largely unenforceable plans, should begin to overcome at least some of the problems of asymmetric information. Indeed, monitoring may provide the only way to overcome these information asymmetries. The monitoring approach also mimics the successful approach taken in the traditional NPDES program governing industrial effluent. Finally, monitoring could also be used to establish "default goals" that help define the types of stormwater discharge improvements that must take place in the future, while leaving it to individual sources to develop the best ways to meet these challenges.[176] Conversely, if monitoring reveals that pollutants in stormwater runoff from a source or cluster of sources are insignificant, then these sources might be expected to implement only a basic, visible type of

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[173] *See, e.g.,* CALIFORNIA PLANNING & DEVELOPMENT REPORT, *supra* note 161, at 12.

[174] *Id.* at 12.

[175] *See* EPA, HANDBOOK, *supra* note 73, at 53 (stating that "documentation and quantification of pollutant characteristics and effects are critical in developing an urban runoff pollution prevention and control plan.").

[176] *Cf.* Ian Ayres & Robert Gertner, *Filling Gaps in Incomplete Contracts: An Economic Theory of Default Rules*, 99 YALE L.J. 87, 91 (1989) ("[P]enalty defaults are purposefully set at what the parties would not want—in order to encourage the parties to reveal information to each other or to third parties . . . .").

structural BMP with no requirements for paperwork or self-inspections.

However, given the added scientific uncertainties that accompany the sampling of runoff, creating a meaningful monitoring system for stormwater discharges will not be easy. The variability of loadings in stormwater produce ample room for missing "upsets" of pollutants as well as unrepresentative hits of large concentrations of pollutants that give false positives.[177] Unlike the NPDES industrial effluent program, which can involve the installation of end-of-the-pipe monitors that take samples at regular intervals, stormwater discharges occur predominantly during storm events and these monitors will not be able to sample runoff continuously or even at regular intervals.[178] Nevertheless, with careful design, monitoring can provide valuable insight about water quality loadings from nonpoint sources—and particularly stormwater discharges—and will help isolate the worst problems in a water body.[179]

Fortunately, the mistakes made by the current stormwater discharge system*s* are instructive in establishing this more comprehensive monitoring system. In contrast to the current federal stormwater discharge program that defers any monitoring activity to the regulated parties, all monitoring should be done by a governmental agency, whether it be local, state, or federal. Creating this centralized and unbiased monitoring system provides a number of benefits. First, it allows a group of experts to develop a systematic monitoring plan that gets the most information for its investment. Sampling locations, for example, could shift: as one contributor is identified and its discharges reduced, the monitoring could shift to other troubled locales. Second, replacing regulated parties' unsupervised "visual" samples and sporadic grab samples of stormwater discharge with a sampling plan developed and implemented by the technical staff of an agency is bound to improve the reliability of sampling. At least one study indicates that composite sampling (taking multiple samples over time) is far superior to grab samples in characterizing stormwater discharges; yet this more expensive and sophisticated monitoring technique is best implemented by a trained team of scientists.[180] Major sources of bias and incompetence, which are

[177] *See supra* note 73; *see generally* EPA, THE USE OF BEST MANAGEMENT PRACTICES, *supra* note 67, at 4–7 (explaining that pollutant measurements can be highly variable).

[178] *See id.* at 4-24 to 4-25.

[179] *See, e.g.*, EPA, HANDBOOK, *supra* note 73, at 53. *See also* Haejin Lee & Michael K. Stenstrom, *Utility of Stormwater Monitoring*, 77 WATER ENVT. RESEARCH, May/June 2005, at 219.

[180] *See* Lee & Stenstrom, *supra* note 179, at 225 (advocating a trained team to con-

especially expected in the difficult job of monitoring runoff, can also be minimized when technical agency staff conducts the sampling. Finally, economies of scale will reduce the cost of this sampling since the lab and the person doing the sampling can do it more efficiently when they do it in "bulk."

In developing a monitoring program, samples should be taken of the stormwater discharge as well as the receiving waters.[181] Together these different sampling efforts provide a relatively robust view of discharge contributions and a basis for imposing greater controls on some facilities and lesser controls on others. Due to the residual uncertainties in analyzing the samples—for example, determining the largest sources of pollutant loadings and what added measures might be necessary—government regulators and scientists would also need to be employed to conduct a rigorous analysis of the sampling results. This analysis should then lead to added, government-specified controls, including requiring the stormwater to be treated if the loading from one or more stormwater sources continues to be high. The costs of this government-sponsored sampling and analysis could be passed off in the price of a stormwater discharge permit.

Comprehensive monitoring would not be a complete replacement for the current NPDES system, but would provide a vital supplement to ensuring the enforceability of existing BMP requirements. Because of the variability in runoff, monitoring will have large sources of error and periodic samples will not be able to provide a definitive measure of stormwater pollutant loads.[182] Thus, even with a reliable monitoring program, stormwater discharge permittees will still need to go on record that they are educated about stormwater controls and identify the controls they have put in place on site to minimize pollution runoff through stormwater. But in contrast to the current system, the permitees will do so knowing that there is now an external check on their compliance with BMPs and an incentive to make them truly effective.

Implementing a full-scale monitoring program in response to the difficulties involved in overseeing stormwater discharges would also begin to redress a larger problem that has generally

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duct composite sampling of stormwater discharges).

[181] *See generally* STORMWATER MONITORING COALITION, MODEL MONITORING TECHNICAL COMMITTEE, MODEL MONITORING PROGRAM FOR MUNICIPAL SEPARATE STORM SEWER SYSTEMS IN SOUTHERN CALIFORNIA, TECHNICAL REPORT #419 (Aug. 2004), *available at* ftp://ftp.sccwrp.org/pub/download/PDFs/419_smc_mm.pdf; EPA, THE USE OF BEST MANAGEMENT PRACTICES, *supra* note 67.

[182] *See id.* at 4-2.

plagued the Clean Water Act. In part, because of the NPDES's success in circumventing the need for science in setting effluent standards, there has been less attention paid to water quality monitoring.[183] Water quality monitoring is not even technically required by the Clean Water Act.[184] Indeed, if anything, the burdensome features of the federal TMDL program—which apply when water quality monitoring reveals that the waters are degraded—may provide perverse incentives for states and localities to remain blissfully ignorant about the state of their waters.[185] Learning that a water body is polluted only increases conflicts between the environmentally-minded public and regulated parties—conflicts that elected officials are likely to dodge. Inept and nonexistent monitoring provides the recipe for keeping these bothersome water quality problems off the political radar.

Given the continued apathy in water quality monitoring, the demand for such a comprehensive monitoring program would need to be a federal requirement. One clear lesson that emerges from the thirty-plus years of implementation of the Clean Water Act is that states and locales will not conduct rigorous water quality monitoring without prodding.[186] Moreover, the uneven quality of the monitoring that is done suggests that some standard federal prescriptions for monitoring are needed.[187] The federal program could also identify the costs of such a monitoring program and suggest how the costs could be rolled over into permit fees. Indeed, to the extent that permit fees of existing stormwater sources provide some of the financial support for a monitoring system, it would make the states and locales more inclined to identify unpermitted sources and bring them into the system.

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[183] *See, e.g.*, EPA, EPA 100-R-98-006, REPORT OF THE FEDERAL ADVISORY COMMITTEE ON THE TOTAL MAXIMUM DAILY LOAD (TMDL) PROGRAM 3 (July 1998), *available at* http://www.epa.gov/OWOW/tmdl/faca/facaall.pdf.

[184] *See* 33 U.S.C. § 1342(p) (2000).

[185] *See* 33 U.S.C. § 1313(d)(1)(C) (2000); *see also* Michael P. Healy, *Still Dirty After Twenty-Five Years: Water Quality Standard Enforcement and the Availability of Citizen Suits*, 24 ECOLOGY L.Q. 393, 395-96, 423-25 (1997) (detailing the ways in which the TMDL program has failed due to the EPA's historic disinterest in the program and the states' inactivity in implementing its requirements).

[186] *See, e.g.,* PUBLIC EMPLOYEES FOR ENVIRONMENTAL RESPONSIBILITY, PEER WHITE PAPER: MURKY WATERS: OFFICIAL WATER QUALITY REPORTS ARE ALL WET 2 (May 1999) (concluding in its executive summary that "an unfortunate mix of politics, bureaucratic inertia and bad science means that conflicting, erroneous and manipulated sets of water quality data containing little accurate information on the actual condition of the nation's rivers and streams are routinely reported by States and dutifully compiled by EPA for presentation to Congress and the public.").

[187] *Id.* at 2–3.

C. Revitalizing Multi-media Regulation

When considering stormwater discharge program reform, it is easy to be swept away by the narrow, bureaucratic framing of the problem that targets regulation only of those with immediate control over the problematic pollutants, namely the owners or users of the land or storm drains. This framing is justified and appropriate for regulatory purposes, but it is not the only framing possible and should not be the sole approach to stormwater controls or water quality improvements.

Stepping back, it is evident that several of the major "problem" sources of pollutants in stormwater runoff are widespread products and activities, some of which can be regulated further upstream at the point of manufacture. Regulating products at their point of manufacture also has the enormous advantage of circumventing asymmetrical information problems, as well as the uncertainties in measuring stormwater sources' contributions to runoff pollution. If problematic sources of pollution are eliminated entirely, e.g., by banning them, then at least those sources of pollution are no longer in need of monitoring or BMPs. Indeed, such an approach capitalizes on the information that science is able to provide—namely the types of products and activities that result in the highest loadings of pollutants nationwide.

One of the most significant products that introduces pollutants through stormwater runoff is the motor vehicle.[188] Vehicle emissions include particulates and gases that ultimately deposit on the land in the form of highly toxic metals and complex hydrocarbons, like polyaromatic hydrocarbons (PAHs).[189] Vehicle exhaust accounts for a significant portion of these pollutants that enter receiving waters in the form of runoff.[190]

Stormwater pollution alone might not provide an adequate impetus to ban or substantially regulate the emissions from motor vehicles, but at the very least, it should be another reason to encourage the development of Low and Zero Emissions Vehicles (LEVs and ZEVs). Since auto emissions have their greatest negative impact on the ability of localities to meet Clean Air Act requirements, there has already been considerable effort dedicated to encourage the development of these LEVs and ZEVs, particularly in California.[191] Yet it appears that water quality concerns are not currently included in the motivation to develop

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[188] *See, e.g.*, EPA, PRELIMINARY DATA SUMMARY, *supra* note 8, at 4-15 to 4-16.

[189] *Id.* at 4-15 to 4-16.

[190] *Id.*

[191] *See, e.g.,* State of California Air Resources Board, Fact Sheet: 2003 Zero Emission Vehicle Program Changes, *available at* http://www.arb.ca.gov/msprog/zevprog/factsheets/2003zevchanges.pdf (last visited Feb. 15, 2006).

this LEV and ZEV technology.[192] If water quality concerns were better publicized, they might provide even more momentum to encourage the development of these vehicles.[193] Beyond subsidizing the development and mass marketing of these vehicles, the federal government could encourage urban areas to develop incentives for ZEV use in order to reduce stormwater pollutants. It is too early to sketch out what these incentive programs might look like. For example, an incentive program may provide greater federal subsidization of municipal sewage treatment plants with greater ZEV use in the urban corridor or reduced water quality monitoring requirements for municipalities with greater ZEV fleets. But the link between changing over to LEVs and ZEVs and reduced pollutant loadings is sufficiently powerful[194] that it could be included in a rigorous stormwater discharge program.

Other products that are repeat contributors to stormwater discharges could also be controlled at the manufacturing stage, most likely through the Toxic Substances Control Act (TSCA).[195] Asphalt sealants, for example, can account for some of the toxins in stormwater runoff: the discovery of the demise of an endangered species in Barton Springs in Austin, Texas was ultimately linked to a toxin released from the sealant applied to an asphalt parking lot uphill from the Springs.[196] Currently there is effectively no meaningful regulatory oversight of these types of products that leach dangerous toxins into bodies of water. Under the TSCA, the EPA generally treats all products the same and does little multi-media analysis to target products that pose particularly significant national risks for air or water.[197] There is nothing precluding the EPA from developing this type of rigor in its implementation of TSCA. The EPA's authority to prioritize and target products that increase pollutants in runoff—both for added testing and regulation—is clear from the broad language

[192] There is some forward momentum in the State of California to examine these air-water connections, however. *See, e.g.,* California Environmental Protection Agency, State Water Resources Control Board, Workshop—Atmospheric Deposition and Water Quality (Feb. 9, 2006), *available at* http://www.waterboards.ca.gov/workshops/atmospheric.html.

[193] *See generally* California ZEV Alliance, Californians Support Zero-Emission Vehicle Program 2 to 1 ZEV Alliance Urges CARB to Hold Firm on ZEV Program, http://www.electrifyingtimes.com/ZEV.html (noticing the disparate benefits of Zero-Emission Vehicle Programs in California) (last visited Feb. 15, 2006).

[194] *See* California ZEV Alliance, *supra* note 193.

[195] *See* 15 U.S.C. § 2601 (2000); 15 U.S.C. § 2603(a) (2000); 15 U.S.C. § 2605(a) (2000).

[196] *See* Kevin Carmody, *City Didn't Provide All Data Needed to Assess Pool Risks*, AUSTIN AM. STATESMAN, Feb. 4, 2003, at A1, A7.

[197] *See* John S. Applegate, *The Perils of Unreasonable Risk: Information, Regulatory Policy, and Toxic Substances Control*, 91 COLUM. L. REV. 261, 268–69 (1991).

of the statute.[198]

As a result, a second multi-media initiative would be for the EPA to identify the types of products—like asphalt sealants—that produce widespread sources of dangerous toxins that leach into waters either as nonpoint pollution or through stormwater discharges—and investigate and potentially regulate them at the site of manufacture. The EPA could require the manufacturers to test these products in terms of their leaching potential and require warnings on the products that alert buyers or even local or state officials as to their elevated toxicity, particularly relative to other types of asphalt sealants that prove less toxic. States or locales, in turn, might decide to ban or tax the more toxic products.

## IV. CONCLUSION

Proper design of an environmental regulatory system requires attention to the entrenched limitations in scientific and technical information that are needed to define and redress the problem. Information asymmetries can also be especially problematic in developing enforceable regulatory requirements.

Unfortunately, the federal stormwater permit program fails to take these information constraints into account. Instead, it reflexively maps the regulation of stormwater discharges onto the NPDES program, which was designed to regulate pollutants in industrial effluent. Because of the program's failure to accommodate the new, added uncertainties related to stormwater, the effort to force-fit stormwater regulation into the existing permit model runs the risk of transforming a very successful model program for industrial effluent into an entirely unsuccessful program for stormwater runoff.

We can do better. External, comprehensive monitoring of waters is long overdue, as are more rigorous controls of pervasive sources of water pollution, like automobile exhaust and asphalt sealants. If we are to make real, meaningful progress on reducing pollutants from stormwater discharge, these and other innovative programs that identify and work around information constraints are essential.

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[198] *See, e.g.,* 15 U.S.C. § 2604(e)(1)(A) (2000) (providing the EPA with authority to mandate added testing if the chemical "may present" a risk or hazard).