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Urbanization, Water Quality, and the Regulated Landscape

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URBANIZATION, WATER QUALITY, AND THE REGULATED LANDSCAPE

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Watershed scientists frequently describe urbanization as a primary cause of water quality degradation, and recent studies conclude that even in lightly-developed watersheds, urbanization often precludes attainment of water quality standards. This article considers legal responses to this pervasive problem. It explains why traditional legal measures have been ineffective, and it evaluates several recent innovations piloted in the northeastern United States and potentially applicable across the nation. It concludes that the innovations, while raising some new problems, represent a promising shift, and it discuss additional reforms and research needed to better reconcile legal water quality standards and traditional land development patterns.

I. INTRODUCTION

Just southwest of Portland, Maine, an inaccurately named little stream called Long Creek flows through a typical American landscape.[1] Hotels, office buildings, manufacturing plants, part of an airport, an interstate, and many smaller roadways lie interspersed within an archipelago of shopping malls. The retailers are a familiar group: Home Depot, Target, Old Navy, Borders, and many more national chains. Despite all the development, Long Creek remains an important community resource. Walking trails line its lower reaches,[2] it empties into a small pond once popular for swimming,[3] and it then flows into Casco Bay, still a distinguishing feature of the region and a driver of the local economy.[4] But Long Creek is polluted, and native aquatic species are mostly gone.[5] The problem is not the causes traditionally blamed for water quality degradation; the watershed contains no industrial outfalls, municipal wastewater treatment plants, or

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[1] *See* Long Creek Watershed, http://www.restorelongcreek.org/maps/Long_Creek_Watershed.pdf (last visited October 7, 2009).

[2] *See* South Portland Land Trust, West End Master Plan (2007), *at* http://www.splandtrust.com/South_Portland_Land_Trust/West_End_Master_Plan_files/MP.pdf.

[3] Interview with Patrick Cloutier, South Portland Water Resources Department, in South Portland, Maine (June 18, 2009).

[4] CASCO BAY ESTUARY PARTNERSHIP, STATE OF THE BAY 2005 4 (2005).

[5] *See* FB ENVIRONMENTAL ASSOCIATES, INC., LONG CREEK WATERSHED MANAGEMENT PLAN (2009); MAINE DEPT. OF ENVTL. PROT., A BIOLOGICAL, PHYSICAL, AND CHEMICAL ASSESSMENT OF TWO URBAN STREAMS IN SOUTHERN MAINE: LONG CREEK & RED BROOK (2002); U.S. EPA, CAUSAL ANALYSIS OF BIOLOGICAL IMPAIRMENT IN LONG CREEK: A SANDY-BOTTOMED STREAM IN COASTAL SOUTHERN MAINE (2007).

farms.[6] Instead, Long Creek is polluted because the surrounding landscape, with all its roads, roofs, and parking lots, no longer sustains water quality.[7]

Nearly forty years ago, Congress enacted legislation intended to protect streams like Long Creek. The Clean Water Act[8] requires every state to set water quality standards for rivers, lakes, coastal waterways, and streams.[9] The states also must identify waters that fail to meet those standards, and the act directs the states to use planning and permitting to ensure that degraded waters come into compliance.[10] Other environmental laws, like the Endangered Species Act and a variety of state and local requirements, could provide additional protection.[11] But despite these laws, and notwithstanding some dramatic water quality improvements,[12] thousands of waterways still fail to meet water quality standards.[13] Problems remain in water bodies of all types, but they are particularly prevalent in city, suburban, and suburban-fringe streams (all of which, for simplicity, this Article just refers to as urban streams[14]). Most, if not nearly all, of these streams have poor water quality.[15] The consequences are problematic: native biodiversity

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[6] U.S. ENVTL. PROT. AGENCY, PRELIMINARY RESIDUAL DESIGNATION PURSUANT TO CLEAN WATER ACT 4 (2008) [hereinafter LONG CREEK PRELIMINARY RESIDUAL DESIGNATION].

[7] *See id.* at 4-9. I use the phrase "water quality" in the same broad sense as the Clean Water Act. *See* 33 U.S.C. § 1251(a) (2006) (declaring that the act protects the "chemical, physical, biological, and radiological integrity of water").

[8] 33 U.S.C. §§ 1251-1387 (2006).

[9] *Id.* § 1313; PUD No. 1 of Jefferson County v. Washington Dept. of Ecology, 511 U.S. 700, 704 (1994).

[10] 33 U.S.C. §§ 1313(d), (e), 1329 (2006).

[11] *See infra* Part II.B.4.

[12] *See, e.g.,* Christopher Maag, *From the Ashes of '69, a River Reborn*, N.Y. TIMES, June 20, 2009, at A18.

[13] *See* EPA, NATIONAL WATER QUALITY INVENTORY: REPORT TO CONGRESS, 2004 REPORTING CYCLE (2009).

[14] This definition is consistent with that used in the extensive scientific literature on urban streams. *See, e.g.,* Seth J. Wenger et al., *Twenty-six key research questions in urban stream ecology: an assessment of the state of the science*, 28 J. N. AM. BENTHOLOGICAL SOC'Y 1080, 1081 (2009) (defining urban "in the broadest possible sense").

[15] *See* EPA, *supra* note 13, at 16 (identifying urban runoff as a major degradation source); COMMITTEE ON REDUCING STORMWATER DISCHARGE CONTRIBUTIONS TO WATER POLLUTION, NATIONAL RESEARCH COUNCIL, URBAN STORMWATER MANAGEMENT IN THE UNITED STATES (2009) (hereinafter

suffers, pollution migrates downstream to lakes, rivers, and the ocean, communities lose aesthetic and recreational benefits from some of their most accessible waterways, and landowners face substantial financial liabilities.[16]

This problem is not new; for years, watershed scientists have known the poor condition of urban watersheds.[17] Nor are scientists ignorant of the underlying causes. Many important questions remain,[18] and degradation typically derives from the combined influence of multiple stressors, but a growing body of scientific literature implicates stormwater runoff[19] from impervious surfaces[20]—roads, parking lots, and roofs, primarily—as a key factor in water quality degradation.[21] Physical solutions exist; while uncertainty about the effectiveness of many measures remains, scientists, planners and engineers have identified a range of possible prevention and mitigation measures.[22] In this sense, urban water quality degradation is little different from air quality degradation, greenhouse gas emissions, terrestrial habitat loss, or the many other environmental problems created or exacerbated by contemporary patterns of urbanization.

NRC); CENTER FOR WATERSHED PROTECTION, IMPACTS OF IMPERVIOUS COVER ON AQUATIC SYSTEMS (2003).

[16] *See* CENTER FOR WATERSHED PROTECTION, *supra* note 15; Craig Anthony (Tony) Arnold, *Clean-Water Land Use: Connecting Scale and Function*, 23 PACE ENVTL. L.J 291, 300-01 (2006).

[17] *See* LUNA B. LEOPOLD, HYDROLOGY FOR URBAN LAND PLANNING—A GUIDEBOOK ON THE HYDROLOGIC EFFECTS OF URBAN LAND USE (1968).

[18] *See* Wenger et al., *supra* note 14 (identifying research questions).

[19] The literature of urban water quality protection often uses the terms or phrases "stormwater," "point source," and "non-point source," and different authors and reports use similar words in different ways. *Compare, e.g.,* UNITED STATES GENERAL ACCOUNTING OFFICE, KEY EPA AND STATE DECISIONS LIMITED BY INCONSISTENT AND INCOMPLETE DATA 5 (2000) (referring to pollution from urban development, which primarily means stormwater, as "nonpoint" source pollution) *with* NRC, *supra* note 15, at 14 (defining "stormwater" to include only stormwater discharged through point sources). I use "stormwater" to refer to water that precipitates during a storm event and then travels over the ground surface. I use the words point source and non-point source consistently with their definitions in the Clean Water Act.

[20] More specifically, many problems arise from *connected* impervious surfaces that discharge either directly to waterways or into stormwater systems that in turn discharge to waterways.

[21] *See* CENTER FOR WATERSHED PROTECTION, *supra* note 15; NRC, *supra* note 15, at 13-35.

[22] *See* NRC, *supra* note 15, at 339-459.

Understanding of the mechanisms of harm is far from perfect, but enough is known to start solving the problem.

Finding a legal fix has proven difficult, however. The Clean Water Act's primary permitting program, the National Pollutant Discharge Elimination System, has been successful on other fronts but has achieved limited progress in controlling stormwater pollution.[23] The act's backup approach, a series of planning and permitting requirements beginning with the development of pollution budgets, or "total maximum daily loads" (TMDLs), has done little to address any sort of water pollution,[24] and faces particularly acute problems when applied to urban stormwater.[25] Other potential legal remedies, like the Endangered Species Act (ESA) or state water quality laws, have helped in a few locales but more often have had little or no effect.[26] All of these regulatory approaches do provide platforms for innovative and highly motivated regulators to act, but none provide spurs to action when, as is often the case, state and local governments are preoccupied with other priorities. Consequently, the water quality problems created by urbanization remain largely unsolved.

That may be starting to change. A variety of regulatory innovations, many within existing statutory frameworks, suggest the possibility of an emergent new approach to addressing urban stormwater pollution.[27] That approach would involve dramatically

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[23] *See* Wendy E. Wagner, *Stormy Regulation: The Problems that Result when Stormwater (and Other) Regulatory Programs Neglect to Account for Limitations in Scientific and Technical Information*, 9 CHAPMAN L. REV. 191 (2006); NRC, *supra* note 15, at 47-122.

[24] *See* OLIVER A. HOUCK, THE CLEAN WATER ACT TMDL PROGRAM: LAW, POLICY, AND IMPLEMENTATION (2002).

[25] *See* Interview with Don Witherill, Director, Division of Watershed Management, Maine Department of Environmental Protection, in Portland, Maine (June 11, 2009); Interview with Melissa Evers, Maine Department of Environmental Protection, in Augusta, Maine (June 22, 2009); Telephone Interview with Christopher Bellucci, Connecticut Department of Environmental Protection (July 8, 2009).

[26] *See infra* Part II.B.

[27] *See infra* Part III.

expanding the scope of NPDES permitting requirements;[28] relying on permitting and funding approaches that allow watershed-scale restoration planning;[29] and expanding the regulatory focus beyond end-of-the-pipe controls to increased regulation of development patterns.[30] Many of the innovations are in their nascent stages, and a fully integrated framework has yet to emerge.[31] But in combination, the innovations could create a more effective system fir protecting urban water quality. That system would focus directly on the relationship between landscape patterns and environmental quality, apply across much of the American landscape, and, importantly, back its shifted focus and expanded scope with a pervasive threat of federal or citizen enforcement.

With that potential change come questions. Scientists may increasingly recognize links between development patterns and water quality, and regulators might respond by integrating local land use controls into federally-mandated permitting systems. But political, judicial, and some academic rhetoric continues to espouse the ideal of local control, with federal environmental law often portrayed as a sclerotic, economically inefficient, overly litigious, and fundamentally anti-democratic force.[32] Such rhetoric is particularly prevalent when land use is at issue.[33] That rhetoric suggests that many powerful lawmakers would resist allowing the Clean Water Act to constrain land use decisions, particularly if the constraints are activated through citizen petitions and lawsuits.

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[28] *See infra* Part III.B (describing residual designation authority).

[29] *See infra* Part III.C (describing the proposed Long Creek permit).

[30] *See infra* Part III.A.

[31] The most detailed suggestions come from the National Research Council's 2008 study of urban stormwater pollution. *See* NRC, *supra* note 15, at 475-555. The innovations discussed and recommendations made in this article parallel some recommendations made by the NRC. However, I focus to a larger extent on the role of mandates and incentives and explore in greater depth the legal practicalities of recommended reforms.

[32] *See infra* notes 269-281 and accompanying text.

[33] *See id.*

The shift in regulatory focus also raises questions about environmental priorities. Urban watershed restoration is expensive,[34] and urban streams, while clearly sometimes important, are rarely the signature environmental features that define a community's sense of identity. Scientists and engineers also question the extent to which heavily urbanized watersheds can be restored,[35] and preventing degradation in lightly urbanized watersheds usually costs much less than restoring streams in already built-out areas.[36] However, even small watersheds can provide significant ecosystem services,[37] and pollution can migrate downstream, creating major problems in larger and more visible waterways.[38] Highly developed watersheds also typically contain many people, and even if restoring those streams is particularly difficult, it may be illogical and inequitable to allow environmental decay in most people's backyards while protecting more pristine but less accessible watersheds.[39] But difficult questions remain about the appropriate extent of restoration, which watersheds should come first, and what criteria should be used to make such judgments.

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[34] *See, e.g.,* LONG CREEK WATERSHED MANAGEMENT PLAN, *supra* note 5, at 80 ("The total cost to implement the Plan will be approximately $14 million.").

[35] *See, e.g.,* Emily S. Bernhardt and Margaret A. Palmer, *Restoring streams in an urbanizing world*, 52 FRESHWATER BIOLOGY 738, 746-47 (2007).

[36] Wenger et al., *supra* note 14, at 1092.

[37] See, e.g., Allison H. Purcell et al., *An Assessment of a Small Urban Stream Restoration Project in Northern California*, 10 RESTORATION ECOLOGY 685, 689, 692-93 (2002); *The Economics of Watershed Protection*, in THE PRACTICE OF WATERSHED PROTECTION 469 (T. Schueler and H. Holland, eds. 2000); Telephone Interview with Tom Blake, Mayor, City of South Portland (February 2, 2010) (describing potential benefits of restoration). "Ecosystem services" are non-monetized benefits that environmental systems provide to people. *See* James Salzman, *Valuing Ecosystem Services*, 24 ECOLOGY L.Q. 887 (1997).

[38] *See* UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, RESIDUAL DESIGNATION PURSUANT TO CLEAN WATER ACT 3-6 (2008) (explaining mechanisms of degradation in Massachusetts' Charles River).

[39] *See* Bernhardt and Palmer, *supra* note 35, at 742; Richard J. Lazarus, *Pursuing "Environmental Justice": The Distributional Effects of Environmental Protection*, 87 NORTHWESTERN L. REV. 787, 788 (1993); Charles P. Lord et al., *Natural Cities: Urban Ecology and the Restoration of Urban Ecosystems*, 21 VA. ENVTL. L.J. 317, 320 (2003).

This article addresses these questions. Part II summarizes the mechanisms of degradation of urban streams, and then explains why the existing legal regime has accomplished little.[40] Part III discusses several emerging regulatory efforts to address urban watershed protection, focusing on several recent initiatives in the northeastern United States.[41] To date, those efforts have largely occurred piecemeal, but they could and, I argue, should become interconnected within a broader, integrated effort at increasing regulatory focus on landscape patterns. In Parts IV and V, I consider two legal challenges raised by this potential regulatory shift, focusing first on federalism issues and then on the questions of prioritization. My conclusions on federalism are fairly clear: in this context, the standard rhetoric is overly simplistic and not particularly constructive. It overlooks the unavoidable interrelationships between land use patterns and environmental quality[42] and rests on dubious assumptions about the necessary preconditions for effective, innovative governance—which, of course, is what federalism ultimately is supposed to promote.[43] In Part V, I map out key issues, including some concerns about the prioritization approaches suggested by current non-legal literature, and close with suggestions for regulatory reform and future interdisciplinary research.[44] The suggested reform, in a nutshell, is that under limited circumstances, EPA should allow states to relax water quality standards for highly urbanized watersheds, but only

[40] While non-legal academics, government agencies, and non-governmental organizations have extensively studied urban watersheds, this article joins a small group of legal-academic analyses. *See* Wagner, *supra* note 23; Arnold, *supra* note 16; NRC, *supra* note 15, at 48-122, 475-560; Avi Brisman, *Considerations in Establishing a Stormwater Utility*, 26 S. Ill. U. L.J. 505 (2002).

[41] I focus on impervious cover TMDLs, residual designation authority, and collective permitting. Each innovation, while local, could be repeated across the nation.

[42] Margaret A. Palmer and J. David Allan, *Restoring Rivers*, 22 ISSUES IN SCIENCE AND TECHNOLOGY 40, 42 (2006) ("The primary reason why so many rivers and streams are still being degraded today is poor land stewardship.").

[43] *See infra* Part IV.B.

[44] This Article is a product of an ongoing research project also involving watershed ecologists and social scientists, and some of our subsequent research will focus on questions raised in this Article.

when that relaxation is balanced by several state commitments, including a strong and readily enforceable program to address the water quality impacts of urbanization across the rest of the landscape.

II. URBANIZATION, DEGRADATION, AND THE LIMITS OF TRADITIONAL REGULATION

To understand why urban water pollution poses a persistent legal challenge, one must first understand something about the mechanisms of degradation. This section therefore briefly[45] explains the underlying biophysical causes of degradation, and then discusses why traditional legal mechanisms have not effectively addressed those causes.

A. "Urban Stream Syndrome"[46]

Urbanized watersheds typically have very different hydrology from undeveloped watersheds. In the latter, some precipitation doesn't reach the ground, and instead remains on leaves, branches, or grass.[47] The rest typically lands on porous surfaces—either partly decayed leaves and duff or, in meadows, matted layers of live and dead grass—which allow infiltration into the ground but impede surface flow.[48] Once in the ground, some water is absorbed into root systems and transpired by plants, some remains as soil moisture, and the rest percolates downward to the water table.[49] It then flows laterally, usually at a very slow rate, until it discharges to surface waters.[50] Only in larger storm events, when the rate of precipitation exceeds the ground's capacity for infiltration,

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[45] Many studies explore this relationship in more depth. For excellent syntheses, see CWP, *supra* note 15, and NRC, *supra* note 15.

[46] *See* Christopher J. Walsh et al., *The Urban Stream Syndrome: Current Knowledge and the Search for a Cure*, 24 J. N. AM. BENTHOLOGICAL SOC'Y 706 (2005).

[47] *See* NRC, *supra* note 15, at 131.

[48] Snow does not infiltrate into or flow over the ground surface until it melts.

[49] C.W. FETTER, APPLIED HYDROGEOLOGY 47-52 (3d. ed. 1994).

[50] *Id.*; NRC, *supra* note 15, at 153 ("[r]esidence times generally increase from surface to subsurface flowpaths").

or on landscapes with abundant bedrock or hard-packed soils does precipitation produce significant quantities of surface runoff.[51]

In several ways, that natural flow regime supports surface water quality. While surface flows tend to warm or cool to ambient surface temperatures, which vary widely over seasons and even days, subsurface conditions vary little, and streams recharged primarily by groundwater flow therefore have fairly stable temperatures. Shade vegetation creates a similar moderating effect, and trees also promote habitat diversity when they fall into waterways.[52] An undeveloped landscape usually contains few pollutant sources, and much of the pollution carried with precipitation or deposited on the land surface filters out as water moves through the ground. And in undeveloped landscapes, watersheds are directly connected to surrounding riparian and upland habitat, allowing species to move between habitat zones as they forage, shelter, and breed. Consequently, the quality of waterways flowing through undeveloped landscapes tends to be quite high.

Urbanization introduces a series of detrimental changes to that hydrology.[53] Human development almost invariably increases the extent of impervious surfaces—pavement and roofs, most importantly, but also compacted soils[54]—which stop water from infiltrating into the ground and force it to flow overland, usually to a system of

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[51] *See* NRC, *supra* note 15, at 158-59.

[52] CENTER FOR WATERSHED PROTECTION, *supra* note 15, at 39, 49 (explaining the importance of large woody debris).

[53] When urbanization displaces agricultural use, the picture is more complex. Urbanization then may accelerate changes in the natural flow regime and increase aggregate pollutant loading, but some individual pollutant loads may decrease. *See* NRC, *supra* note 15, at 177; Wenger et al., *supra* note 14, at 1084.

[54] Turf, though usually considered a pervious surface, often grows over compacted soils with less infiltration capacity than undeveloped areas. Turf therefore falls into an intermediate category. *See* NRC, *supra* note 15 , at 139-40.

storm drains and sometimes directly to receiving waters.[55] Because these overland flows move much faster than groundwater, more water reaches streams during and shortly after rainstorms, increasing, often dramatically, the frequency and intensity of high flows.[56] Meanwhile, groundwater flows diminish, and recharge rates between storm events drop.[57] Water extractions can exacerbate this effect; lawns and landscaped vegetation usually require irrigation, which can increase pumping from aquifers already depleted by reductions in recharge.[58] Consequently, urbanized watersheds frequently experience "flashy" flow, with higher flows, and often even floods, during storm events and lower or non-existent flows in dry periods.[59]

For a variety of reasons, the composition of urban runoff also differs from runoff in undeveloped areas.[60] Lawn fertilizers and pesticides, oil and grease from cars and machinery, heavy metals scraped from brake pads and tires, salts from snow and ice treatment, sediment from construction sites, and aromatic hydrocarbons from fuel combustion, among other pollutants, all come with urban development, and most increase in proportion to the extent of impervious surfaces.[61] Other pollutants, like animal feces or atmospherically-deposited nitrogen or mercury, occur in both urban and undeveloped areas, but with the filtering effects of subsurface flow diminished, those pollutants are

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[55] Bernhardt and Palmer, *supra* note 35, at 740.

[56] NRC, *supra* note 15, at 166-70.

[57] Bernhardt and Palmer, *supra* note 35, at 740.

[58] *See, e.g.,* ROBERT GLENNON, WATER FOLLIES: GROUNDWATER PUMPING AND THE FATE OF AMERICA'S FRESH WATERS 99-111 (2002) (discussing urbanization in Massachusetts' Ipswich River watershed). For extensive discussion of urbanization and water supply, *see* WET GROWTH: SHOULD WATER LAW CONTROL LAND USE (Craig Anthony Arnold ed. 2005).

[59] *See* Bernhardt and Palmer, *supra* note 35, at 740. An exception to this trend can where wastewater effluent or recharge from excess landscape irrigation produce artificially steady flows. *See* NRC, *supra* note 15, at 155, 193.

[60] *See* NRC, *supra* note 15, at 176-92.

[61] *See* CENTER FOR WATERSHED PROTECTION, *supra* note 15, at 55-92. The primary exception is fertilizer and pesticide loading, which derives primarily from lawns and landscaped areas. *See id*. at 69.

more likely to reach surface waters in urban areas.[62] Temperatures also change; urban landscapes often warm and sometimes cool runoff, leading to greater temperature variability than in undeveloped landscapes.[63] Often these pollutants arrive in pulses, particularly when rain falls after extended dry periods or, in colder regions, when snow melts.[64] In watersheds with combined sewers,[65] the pulses are particularly pronounced; runoff from small storm events may be treated, but larger storms can overflow treatment systems and discharge mixtures of untreated stormwater and raw sewage.[66]

Urbanization also changes the morphology of streams. Some of the changes are obvious, as streams are channelized, routed through culverts and dams, or even buried.[67] Development often displaces riparian habitat, severing connections between streams and the surrounding habitat and removing shade vegetation. The loss of riparian vegetation limits the influx of large woody debris, which provides important habitat in healthy streams.[68] Flow changes also affect the physical shape of streambeds. High flows tend to be erosive, and a stream with flashy flows will often widen and deepen its bed.[69] That erosion then increases the sediment load of the stream, and also can raise its temperature as the stream undermines its shade vegetation.[70] Habitat diversity typically diminishes,

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[62] *See id*. at 17.

[63] Wenger et al., *supra* note 14, at 1087; CENTER FOR WATERSHED PROTECTION, *supra* note 15, at 50.

[64] NRC, *supra* note 15, at 268 (describing "first-flush effects"); CENTER FOR WATERSHED PROTECTION, *supra* note 15, at 58. For discussion of snowmelt, see NRC, *supra* note 15, at 196-203.

[65] "Combined sewer systems are sewers that are designed to collect rainwater runoff, domestic sewage, and industrial wastewater in the same pipe." U.S. Environmental Protection Agency, Combined Sewer Overflows, http://cfpub.epa.gov/npdes/home.cfm?program_id=5 (last visited February 22, 2010).

[66] *See* Charles Duhigg, *As Sewers Fill, Waste Poisons Waterways*, N.Y. TIMES, November 22, 2009, at A1.

[67] *See* NRC, *supra* note 15, at 162-66.

[68] CENTER FOR WATERSHED PROTECTION, *supra* note 15.

[69] *Id.* at 32-48.

[70] NRC, *supra* note 15, at 174 ("this source can become the largest single fraction of the sediment load in an urbanizing watershed").

with riffles, pools, and bends replaced by a straighter stream with a more homogenous substrate.[71]

The aggregate consequence of these changes usually is a stream with different morphology and biology than streams in undeveloped areas.[72] Native biodiversity decreases, with sensitive (and, sometimes, legally protected[73]) species declining or disappearing.[74] Streams can lose aesthetic appeal, with low, sluggish flows moving through wide, devegetated streambeds except during occasional periods of high flow or flood.[75] These changes are pervasive. Recent surveys conclude that water quality tends to decline markedly when impervious surfaces cover more than ten percent of a watershed, and that small watersheds with more than 25% impervious cover almost always exhibit poor water quality.[76] Even sparse exurban development, if spread across a watershed, will exceed the former threshold, and stream degradation therefore is a standard feature of the landscapes in which most Americans live, work, and shop.[77] The correlation between impervious cover and degradation in larger watersheds is less clear; larger watersheds, while clearly still impacted, seem to exhibit somewhat greater

[71] *Id*. at 174-75.

[72] CENTER FOR WATERSHED PROTECTION, *supra* note 15, at 3 ("a negative relationship between watershed development and nearly all of the 26 stream quality indicators has been established over many regions and scientific disciplines.").

[73] *See, e.g.,* Seth J. Wenger et al., *Stream Fish Occurrence in Response to Impervious Cover, Historic Land Use, and Hydrogeomorphic Factors*, 65 CAN. J. FISH & AQUATIC. SCI. 1250 (2008).

[74] *See* NRC, *supra* note 15, at 220, 231; Wenger et al., *supra* note 14, at 1083.

[75] *See* CENTER FOR WATERSHED PROTECTION, *supra* note 15, at 40. Those floods can be destructive and dangerous. *See* Arnold, *supra* note 16, at 300-01.

[76] *Id.* at 1-2; NRC, *supra* note 15, at 226-30. The 10% and 25% thresholds "are not sharp 'breakpoints,'" and the percentage of impervious cover in a watershed "[d]oes not predict the precise score of an individual stream water quality indicator." CENTER FOR WATERSHED PROTECTION, *supra* note 15, at. at 2-3.

[77] CENTER FOR WATERSHED PROTECTION, *supra* note 15, at 9 ("most suburban and even rural zoning categories exceed 10% IC").

resilience.[78] But thousands of urban streams, small rivers, and even larger watersheds are significantly degraded by stormwater pollution from roofs and pavement.[79]

While urbanization almost invariably lowers water quality, a variety of mechanisms can mitigate the effects.[80] Builders can reduce the footprints of buildings and the area of roads, or can substitute pervious pavement and green roofs[81] for traditional road surfaces and building designs.[82] Impervious surfaces can drain into infiltration swales or rain gardens rather than into storm drainage systems.[83] Prohibitions on toxic products,[84] educational programs, and maintenance programs like street sweeping can reduce pollutant loading.[85] Uncertainties about treatment remain; few watershed-scale studies document the effectiveness of mitigation programs, and most researchers expect that no amount of planning and engineering can turn an urbanized landscape into the hydrologic equivalent of a forest.[86] These solutions also cost money, particularly when they require retrofitting already-developed areas, and financial constraints therefore could prevent full mitigation even if it were theoretically possible. But such measures, if transformed into standard practice, clearly could slow the

[78] *See* NRC, *supra* note 15, at 220.

[79] EPA, *supra* note 13, at 16, 19, 23; EPA, *supra* note 38, at 3-6 (documenting degradation of the Charles River watershed).

[80] The Center for Watershed Protection's website (http://www.cwp.org/Store/guidance.htm) links many articles discussing restoration techniques.

[81] "A green roof … is a vegetative layer grown on a rooftop." EPA, Green Roofs, http://www.epa.gov/heatisland/mitigation/greenroofs.htm (last visited February 22, 2010).

[82] *See* NRC, *supra* note 15, at 142.

[83] *See, e.g., id*. at 137 (showing connected and disconnected roof drains).

[84] For example, "[l]ead concentrations in stormwater have [] significantly decreased since the elimination of lead in gasoline." *Id*. at 260.

[85] *See, e.g.,* Think Blue Maine, *Ducky Ad*, *at* http://www.youtube.com/watch?v=XLt8c2fO3QU (last visited February 19, 2010).

[86] *See* CENTER FOR WATERSHED PROTECTION, *supra* note 15, at 21-22 ("no community has yet demonstrated that they can achieve water quality standards in an urban watershed that exceeds 25% IC"); Wenger et al., *supra* note 14, at 1085.

degradation of water quality in developing areas and improve it where development already has taken place.

B. Traditional Legal Responses

If impaired urban water quality is a pervasive problem but remedial tools exist, a logical next question is what combination of mandates and incentives will best facilitate those tools' use. That question is largely legal, and traditional environmental laws attempt to provide some answers. But those answers have not proven particularly effective. Neither of the Clean Water Act's two primary regulatory systems has provided anything approaching full protection against the water quality effects of urbanization. Nor have other mechanisms—most notably, state regulatory systems and the federal ESA—filled the void. The picture is far from completely negative; each approach has led to some protection, and with each the trend may be toward greater effectiveness. But still, much room for progress remains.

1. The NPDES Program

The Clean Water Act's primary mechanism for controlling water pollution is the National Pollutant Discharge Elimination System (NPDES).[87] The system applies to "any addition of any pollutant to navigable waters from any point source,"[88] and the act defines "point source" to include most human-controlled systems for conveying pollutants directly or indirectly to surface waters.[89] No such discharge may occur without a permit,[90] and the permits usually specify numeric limitations on pollutant

[87] *See* 33 U.S.C. § 1342 (2006).

[88] *Id.* 1362(12) (defining "discharge of a pollutant); *id.* § 1311(a) (establishing a general prohibition on unpermitted discharges of pollutants). For discussion of exceptions to this general rule, see *infra* Part III.B.

[89] 33 U.S.C. § 1362(14) (2006).

[90] *Id.* § 1311(a).

concentrations.[91] Permittees must monitor their discharges,[92] and violations expose the permittee to governmental enforcement or citizen suits.[93] While the system has received some criticism,[94] most commentators credit the NPDES program with achieving dramatic pollution reductions.[95] But while highly successful in many ways, the NPDES program is widely viewed as a poor system for controlling stormwater pollution.[96]

One problem with the NPDES program is the difficulty of monitoring stormwater quality.[97] The program works well for sources like industrial outfalls or wastewater treatment plants, which produce continuous and relatively consistent effluent flows—or, if they produce spikes, do so at predictable times. Stormwater, by contrast, flows on nature's unpredictable schedule, and pollutant concentrations tend to vary within and between storm events, complicating sampling efforts.[98] EPA's regulations acknowledge these complications by imposing only limited sampling requirements, and many permits require little or no testing.[99] Because of variations in stormwater quality, the few samples that are collected may not be representative.[100]

Even if comprehensive, continuous testing of stormwater effluent were possible, that testing would likely fail to reveal important data. The rate of stormwater flow can

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[91] *Id.* §§ 1316, 1317.

[92] *Id*. § 1318.

[93] *Id.*. §§ 1319, 1365.

[94] *See, e.g.,* Cass R. Sunstein, *Administrative Substance*, 1991 DUKE L.J. 607, 627-30; Bruce A. Ackerman and Richard B. Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1333, 1333-40 (1985).

[95] *See, e.g.,* Wagner, *supra* note 23, at 198-201.

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

[97] *See* NRC, *supra* note 15, at 329 (describing monitoring and modeling as "what might be the two weakest parts of the stormwater program").

[98] *See* NRC, *supra* note 15, at 266 (describing sampling methodologies), 276-77 (describing problems experienced by communities responsible for monitoring).

[99] *See id*. at 258.

[100] *See id.* at 262, 284. The University of Alabama has compiled a national stormwater database, however, which can help municipal stormwater managers predict site-specific conditions without extensive outfall monitoring. *See* MS4 Project, *at* http://unix.eng.ua.edu/~rpitt/Research/ms4/mainms4.shtml (last visited February 25, 2010).

matter just as much as, if not more than, stormwater's chemical composition, for flow rates help determine stream channel morphology, temperature, erosion and associated sediment loading, and, of course, instream flow levels.[101] Effluent testing also may not reveal the ultimate sources of pollutants, and thus may not provide permittees and regulators with sufficient information to institute effective source controls. Because dozens of properties and multiple roadways can contribute runoff to a single municipal outfall, testing revealing excessive pollutant concentrations will not indicate which properties or roads—let alone which areas within those properties or roads—are primarily to blame.

Those data shortages have led EPA to use a different type of standard than it uses for traditional industrial or wastewater treatment plant outfalls.[102] For conventional point sources, EPA sets numeric standards that limit the concentrations of pollutants in effluent.[103] Stormwater permits instead require implementation of "best management practices" (BMPs)—engineering, housekeeping, and, sometimes, educational measures designed to reduce pollutant discharges.[104] Some sources also must periodically test discharges, but only infrequently, and for many potential sources, BMP implementation is the only permit requirement.[105] Consequently, even if BMPs are fully implemented and carefully maintained, little or no independent oversight affirms that they are actually working.[106] And while implementation and maintenance of some BMPs is easy to monitor, assessing compliance with others can be difficult, which leaves regulators and

[101] *See supra* notes 56-79 and accompanying text.
[102] *See* Wagner, *supra* note 23, at 203 (explaining the different approaches).
[103] *See* 33 U.S.C. §§ 1316, 1317 (2006).
[104] *See* Wagner, *supra* note 23, at 206, 209.
[105] *See* NRC, *supra* note 15, at 258; Wagner, *supra* note 23, at 210.
[106] *See* Wagner, *supra* note 23, at 205, 213, 217. One cannot assume that implemented BMPs are fully effective, for there are substantial "error bars and uncertainties surrounding the pollution control capabilities of various BMPs." *Id.* at 204.

non-profit groups with little ability to verify and, if necessary, enforce compliance.[107] Finally, while BMPs are typically designed to keep chemical and biological pollutants out of stormwater, other sources of degradation, like temperature increases and altered flow levels, often escape control.[108]

Adding to all of these limitations is the circumscribed applicability of the NPDES stormwater program. If stormwater does not pass through a point source—that is, if it simply runs off a site as sheet flow—the runoff does not meet the Clean Water Act's definition of "discharge," and does not require a NPDES permit, even if it conveys pollutants into waterbodies.[109] Nor are all point source stormwater discharges subject to regulation. In 1987, after EPA had struggled for years to fit stormwater into its regulatory program (after previously attempting, unsuccessfully, to avoid doing so[110]), Congress amended the NPDES program to include some stormwater sources but to leave others out.[111] Industrial sources, including the entire manufacturing sector, large construction sites, and larger municipal storm sewers were to be included by 1990,[112] and EPA later expanded the program to include smaller construction sites and smaller municipal systems.[113] But private, non-industrial stormwater drainage systems—for example, drainage systems from shopping malls or office parks—and municipal discharges from areas that do not meet the statutory criteria still fall outside the program,

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[107] *See id*. at 220-21.

[108] Exacerbating this problem is the discretion industrial facilities enjoy in selecting BMPs, which means that facilities may focus on pollution that can be controlled cheaply rather than pollution that causes the greatest downstream impact. *See id*. at 216-17.

[109] 33 U.S.C. §§ 1311(a) (2006) (prohibiting discharges of pollution); *id.* § 1362(12) (defining discharges as additions of pollution to navigable waters from point sources); *id.* § 1362(14) (defining point sources)

[110] *See* Natural Resources Defense Council v. Costle, 568 F.2d 1369 (D.C. Cir. 1977).

[111] *See* 33 U.S.C. § 1342(p) (2006).

[112] *Id.* § 1342(p)(2).

[113] 40 C.F.R. § 122.26(a) (2009). Many regulated sources still fail to obtain permits. *See* Wagner, *supra* note 23, at 211-12.

unless EPA or state regulatory authorities affirmatively act to include them.[114] Until quite recently, neither EPA nor any state authority had ever taken that step.

The NPDES stormwater program is by no means completely ineffective. Permittees do have obligations, and while compliance data are sparse, clearly some businesses and municipalities do make substantial efforts at stormwater control.[115] If a state is highly motivated to address stormwater issues, it may use its NPDES permitting authority as leverage to compel local action.[116] Recent permit proposals also suggest that EPA may yet use the NPDES program as a platform for developing innovative and more stringent regulatory requirements,[117] and studies of stormwater management often identify the existing program as a useful starting point.[118] Key elements of the program are fairly new; smaller municipal systems, for example, have been permitted only since 2003, and the program may grow more effective as permittees become more accustomed to its requirements. Nevertheless, the widespread critiques of the program and the persistence of stormwater-driven water quality problems suggest that ample room for improvement remains.

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[114] 33 U.S.C. § 1342(p) (2006). Some landowners are regulated indirectly, with the municipal stormwater manager compelled to meet its obligations by regulating private owners. But local water managers still may feel that controlling private stormwater management practices strains their regulatory authority and political clout. *See* Cloutier Interview, *supra* note 3. Also, requirements for municipal permittees generally do not focus on the impacts of existing impervious cover, and requirements for new development are only very generally stated. *See* 40 C.F.R. § 122.34 (2009).

[115] *E.g.* Cloutier Interview, *supra* note 3; Interview with Brenda Zollitsch, Facilitator, Bangor Area Stormwater Network, Portland, Maine (January 4, 2010). Both Mr. Cloutier and Ms. Zollitsch described extensive efforts pursuant to the MS4 program.

[116] *See, e.g.,* EPA, Watershed-Based Permitting Case Study, Michigan Statewide Stormwater Permitting (2007), http://www.epa.gov/npdes/pubs/wq_casestudy_factsht3.pdf (describing a successful effort in Michigan's Rouge River watershed); EPA, Watershed-Based Permitting Case Study, Tuluatin River Watershed, Oregon 1 (2007), http://www.epa.gov/npdes/pubs/wq_casestudy_factsht4.pdf.

[117] *E.g.* U.S. E.P.A., General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems: Authorization to Discharge Under the National Pollutant Discharge Elimination System (2008), *available at* http://www.epa.gov/NE/npdes/stormwater/nh/Draft-NH-Small-MS4-Permit.pdf (draft general permit for parts of New England). This proposed permit includes requirements for inventorying and mapping impervious surfaces.

[118] *E.g.,* NRC, *supra* note 15, at 475- 555.

2. TMDLs

While centrally important, the NPDES program is not the Clean Water Act's sole mechanism for addressing water pollution. The act also requires states to prepare pollution budgets, or "total maximum daily loads," for water bodies not likely to attain water quality standards through technology-based controls alone.[119] Those budgets are to be implemented through both permitting[120] and planning.[121] This system should function as a backup approach, assuring attainment of water quality goals where technology-based controls alone aren't sufficient.[122] In practice, however, the TMDL approach has produced limited results.

Little has been accomplished partly because EPA and the states took so long to begin implementing the TMDL program.[123] Only in the 1990s, after two decades in which TMDL requirements were almost completely ignored, did a series of environmental lawsuits succeed in jump-starting the program.[124] But because of the delay—and the complexity, once the process actually begins, of drafting and implementing TMDLs—TMDL implementation in thousands of watersheds remains in its early stages.[125]

The terms of the Clean Water Act also limit the TMDL program's effectiveness. Section 303(d) requires states to develop water quality standards, identify water bodies that are failing to meet those standards, and develop overall pollution budgets for those

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[119] 33 U.S.C. § 1313(d) (2006).
[120] *Id*. § 1312(a).
[121] *Id*. § 1313(e); 40 C.F.R. § 130.6 (2009).
[122] *See* Pronsolino v. Nastri, 291 F.3d 1123, 1126 (9th Cir. 2002).
[123] HOUCK, *supra* note 24, at 12-24, 49-56; *see, e.g.* Sierra Club v. Hankinson, 939 F. Supp. 865, 871-72 (N.D. Ga. 1996) (describing Georgia's poor progress).
[124] HOUCK, *supra* note 24, at 49-56.
[125] *See* LEONARD SHABMAN ET AL., ADAPTIVE IMPLEMENTATION OF WATER QUALITY IMPROVEMENT PLANS: OPPORTUNITIES AND CHALLENGES 28 (2007) ("More than 40,000 TMDLs remain to be implemented…").

water bodies.[126] EPA's regulations go a step further, requiring that the TMDL divide the total pollution budget between sources (or categories of sources).[127] The Clean Water Act also links TMDLs to individual NPDES permits, which must contain effluent limits sufficiently stringent to attain water quality standards.[128] Finally, the act requires state planning processes and allows federal grants to support these planning efforts.[129] The act, in short, imposes many obligations. But it does not require that TMDLs include enforceable controls on specific sources.[130] And if states fail to generate plans, or if their plans propose insufficient controls, the federal government cannot step in and substitute its own plans.[131] State plans also are not federally enforceable, and citizen suits compelling implementation are possible only if authorized by state law.[132] TMDLs are not completely inconsequential; if states are motivated to address water quality problems, the TMDL process can provide a method for doing so.[133] But the historic lack of state interest and the inherent weaknesses in the TMDL program leave most TMDLs as documents of, at most, uncertain regulatory importance.

Those problems exist for all TMDLs, but the TMDL method is particularly problematic when applied to urban stormwater, where its informational demands are both

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[126] 33 U.S.C. § 1313(d) (2006).

[127] 40 C.F.R. §§ 130.2(f), (g), (h), 130.7(a) (2009).

[128] 33 U.S.C. § 1312 (2006).

[129] *Id*. §§ 1313(e), 1319.

[130] Pronsolino v. Nastri, 291 F.3d 1123, 1140 (9th Cir. 2002) ("States must implement TMDLs only to the extent that they seek to avoid losing federal grant money.").

[131] William F. Pedersen, Jr., *Turning the Tide on Water Quality*, 15 ECOLOGY L.Q. 69, 80 (1988).

[132] *See* HOUCK, *supra* note 24, at 204-05.

[133] *See* THE CENTER FOR TMDL AND WATERSHED STUDIES AT VIRGINIA TECH, TMDL IMPLEMENTATION – CHARACTERISTICS OF SUCCESSFUL PROJECTS (2006); *see, e.g.,* ENVTL. PROT. AGENCY, WATERSHED-BASED PERMITTING CASE STUDY, LONG ISLAND SOUND, CONNECTICUT 2 (2008), http://www.epa.gov/npdes/pubs/wq_casestudy_factsht1.pdf (describing a TMDL spurring state regulatory efforts); ENVTL. PROT. AGENCY, WATERSHED-BASED PERMITTING CASE STUDY, NEUSE RIVER WATERSHED, NORTH CAROLINA 6 (2007), http://www.epa.gov/npdes/pubs/wq_casestudy_factsht11.pdf (quoting a North Carolina Department of Environmental Quality representative, who observed that for a watershed permitting organization to function effectively, "[t]here needs to be a TMDL to drive the need for membership").

excessively ambitious and misdirected. Clean Water Act section 303 asks states to determine the maximum allowable daily load of each pollutant contributing to water quality impairments.[134] That requirement presumes that state regulators can determine what each contributing pollutant is and what mass of that particular pollutant (allowing for a margin of error) the water body can assimilate. Often, however, and particularly often with urban streams, regulators lack that knowledge.[135] Urban stream impairment typically arises from a confluence of causes, including loading of multiple pollutants, changes to flow regimes, and habitat loss.[136] Separating the combined effects of those stressors and generating allowable loads for each individual pollutant is very difficult, if not impossible. A focus on individual pollutants also is likely to ignore key stressors. Flow alterations, though potentially qualifying as "pollution" under the Clean Water Act, do not meet the act's narrower definition of "pollutant," and therefore would not be included in a traditional TMDL.[137] That does not mean regulators are ignorant about the causes of impairment; ironically, they may understand the underlying problem, for most stressors are ultimately traceable to or correlated with the extent of connected impervious cover in the watershed.[138] But the intermediate links in the causal chain are difficult to discern, and it is on those intermediate links that the traditional TMDL approach focuses.

In practice, this makes traditional, pollutant-by-pollutant TMDLs for urban impaired streams hard to draft and difficult to use. State regulators consistently told me

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[134] 33 U.S.C. § 1313(d)(1)(C), (D) (2006).

[135] Evers interview, *supra* note 25; Witherill interview, *supra* note 25; Bellucci interview, *supra* note 25. Informational challenges are by no means unique to urban stormwater TMDLs. *See* GAO, *supra* note 19; SHABMAN ET AL., *supra* note 125, at 14-20.

[136] *See supra* Part II.A.

[137] *See* 33 U.S.C. § 1362(6) (2006) (defining "pollutant"); *id.* § (19) (defining "pollution" as "the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water"); Reed D. Benson, *Pollution Without Solution: Flow Impairment Problems Under Clean Water Act Section 303*, 24 STAN. ENVTL. L. J. 199, 235-36 (2005).

[138] *See supra* Part II.A.

that they had struggled to generate traditional TMDLs for urban impaired streams.[139] While they were confident that impairment ultimately derived from connected impervious cover, they could not isolate specific intermediate stressors, even after completing extensive stressor analyses.[140] Nor did they think fulfilling the TMDL requirements was a necessary predicate for restoration efforts. As long as regulators had some rigorous documentation of the root causes of watershed impairment, fulfilling all of the specific TMDL requirements seemed like a waste of time.[141] Consequently, they found the combination of TMDL requirements and impaired urban streams to be, as one regulator put it, "a square peg and a round hole."[142]

3. Other Legal Regimes

While the Clean Water Act is the nation's primary water quality law, it is not the only law that might address urban stormwater problems. Two other candidates—state and local water quality laws and the federal Endangered Species Act—also seem promising, the former because our federalist system deliberately allows states to supplement federal efforts, and the latter because impairment of urban streams is, in large part, a problem of lost biodiversity. And in fact, both state water quality laws and the ESA have sometimes contributed to legal responses to urban stream impairment, and may do so to a greater extent in the future. But, as with the Clean Water Act, neither solution has been or promises to be anything approaching comprehensive.

a. State and local laws

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[139] Evers interview, *supra* note 25; Witherill interview, *supra* note 25; Bellucci interview, *supra* note 25.

[140] Evers interview, *supra* note 25; Bellucci interview, *supra* note 25.

[141] Witherill interview, *supra* note 25. Witherill explained that the Long Creek restoration project proceeded without a TMDL largely because earlier studies of the watershed provided more information than a TMDL report would contain.

[142] *Id*.

The Clean Water Act clearly allows states to supplement federal requirements.[143] Local governments also may establish their own water quality controls, so long as those controls aren't preempted by state law, and can use their traditional land use authority to encourage development patterns compatible with water quality protection. In theory, therefore, state and local authority could compensate for any weakness in the federal system of stormwater regulation.

Some state governments have taken up that invitation. A few state regulatory programs apply to development sites that would not trigger federal regulation.[144] Some limit the effective impervious cover of new developments,[145] encourage or even require undeveloped buffers in riparian areas,[146] or establish growth controls designed to preserve undeveloped watersheds. [147] Many local governments have implemented their own programs, some of which are quite sophisticated.[148] These state and local efforts demonstrate that the federal government is not the only potential source of effective

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[143] PUD No. 1. v. Wash. Dept. of Ecology, 511 U.S. 700, 723 (1994) (Stevens, J. concurring) ("Not a single sentence, phrase, or word in the Clean Water Act purports to place any constraint on a State's power to regulate the quality of its own waters more stringently than federal law might require.").

[144] *See, e.g.,* 30 Maine Rev. Stat. § 420-D (requiring stormwater permits for any "project that includes one acre or more of disturbed area").

[145] *E.g.* Md. Code, Natural Resources, § 8-1808.3 (establishing coverage limits for developments near Chesapeake Bay); In re Protest of Coastal Permit Program Rules, 807 A.2d 198, 207, 232-37 (N.J. Super. A.D., 2002) (upholding limitations on impervious area).

[146] *See, e.g.,* Maryland Dept. of Natural Resources, Riparian Forest Buffer Restoration: Maryland Stream ReLeaf, *at* http://www.dnr.maryland.gov/forests/programapps/rfbrestoration.asp (describing an incentive-based program); EPA, Watershed-Based Permitting Case Study, Big Darby Creek, Ohio, *at* http://www.epa.gov/npdes/pubs/wq_casestudy_factsht12.pdf (last visited December 29, 2009) (describing control measures including development limits for areas near streams).

[147] *See, e.g.,* Chang-Hee Christine Bae, *Salmon Protection in the Pacific Northwest: Can it Succeed*, 17 N.Y.U. ENVTL. L.J. 559, 561-66 (2008) (describing local controls imposed pursuant to Washington's Growth Management Act); Greenwood v. Mayor and Tp. Committee of Tp. of Hopewell, 2008 WL 3462431 (N.J. Super. A.D., 2008) (upholding a local zoning ordinance designed to minimize impervious cover by prescribing large lot sizes).

[148] *See, e.g.*, Dolan v. City of Tigard, 512 U.S. 374, 378-80 (1994); Quick v. City of Austin, 7 S.W. 3d 109 (Tex. 1998) (upholding Austin's Save Our Springs Ordinance, which limits impervious cover, requires setbacks from streams, and precludes new development from adding additional stormwater pollutants); Donya Williamson, *Note, Urbanites versus Rural Rights: Contest of Local Government Land-Use Regulations Under Washington Preemption Statute 82.02.020*, 84 WASH. L. REV. 491, 509-11 (2009). For case studies of local programs, see CENTER FOR WATERSHED PROTECTION, THE SMART WATERSHED BENCHMARKING TOOL (2006).

regulation of urban stormwater. Indeed, an optimal regulatory approach probably would include the kinds of development controls instituted by many cities and some states, and would allow for other types of state and local innovation.[149]

Nevertheless, these effective state and local steps are far from pervasive. Most states have not established any requirements that exceed the federal baseline.[150] A few states have completely left the field to the federal government, electing not to assume authority over the NPDES program.[151] Others have taken over NPDES permitting authority, but have left that authority largely unexercised.[152] Many states have actually taken affirmative steps to foreclose the possibility of supplementing the federal regulatory regime. By enacting laws that preclude state administrative agencies from establishing any requirements more strict than those of federal law, those states have effectively made federal requirements the only game in town.[153] At the local level, the examples of innovative stormwater regulation, while impressive, also remain exceptional; most local governments continue to look to the state or federal governments for regulatory direction.

The rarity of state and local initiative should not be surprising. For years, most state and local governments have been reluctant participants in water quality

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[149] In Maine, for example, state-law limits on runoff from new developments provide a valuable preventive complement to residual designation authority, TMDLs, and other regulatory provisions with more of a remedial focus. *See* MAINE REV. STAT. ANN. TIT. 38, § 420-D (2001 & Supp. 2009); 06 096 ME. CODE R. §§ 500, 502 (2006). State regulators consistently told me they view those requirements, while helpful, as insufficient to mitigate all impacts of development.

[150] I base this assertion on a research assistant's survey of state regulatory requirements (on file with the author), which revealed that only a small minority of states have requirements that exceed the federal program in scope or stringency.

[151] *See id*.

[152] *See* Charles Duhigg, *Clean Water Laws Neglected, at a Cost to Health*, N.Y. TIMES, Sept. 13, 2009, at A1.

[153] *See* William L. Andreen, *Federal Climate Change Regulation and Preemption*, 3 ENVT'L & ENERGY L. & POL'Y J. 261, 279-80 (2008); Andrew Hecht, *Obstacles to the Devolution of Environmental Protection: States' Self-Imposed Limitations on Rulemaking*, 15 DUKE ENVTL. L. & POL'Y F. 105 (2004).

protection.[154] Where states have assumed primary implementation authority, progress has often lagged.[155] Consequently, while some important state and local efforts will likely continue to occur, there is little reason to expect that these initiatives will fill the gaps in the system of federal law.

b. The ESA

The Endangered Species Act might also seem to offer a remedy for water quality problems caused by urbanization. The ESA is the nation's primary legal mechanism for protecting biodiversity, and urban water quality problems typically lead to biodiversity loss.[156] But for several reasons, the ESA has not yet been a particularly important source of protection for urban streams.

First, streams in urbanizing areas tend to lose sensitive species quickly, and most urban watersheds therefore don't contain threatened or endangered species.[157] Second, most of the decisions that lead to urbanization don't involve the federal government. [158] Section 7 of the ESA, which precludes federal agencies from taking actions likely to "jeopardize" listed species or adversely modify their critical habitat, therefore does not apply.[159] Third, the complex causal links between urbanization and water quality impacts limit the ESA's relevance. Where species losses derive from the cumulative impact of many individual decisions or from uncertain causes, the FWS and NOAA Fisheries have

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[154] *See e.g.* HOUCK, *supra* note 24 (describing states' reluctance to develop and implement TMDLs).

[155] *See* Duhigg, *supra* note 152.

[156] *See supra* Part II.A.

[157] *See, e.g.,* Wenger et al., *supra* note 73, at 1257 (documenting species' disappearance at low effective impervious cover levels).

[158] *See* Rapanos v. United States, 547 U.S. 715 (2006) (limiting federal wetlands authority); Solid Waste Agency of Northern Cook County v. Army Corps of Engineers, 531 U.S. 139 (2001) (same); National Ass'n of Home Builders v. Defenders of Wildlife, 551 U.S. 644 (2007) (holding that EPA's delegations of NPDES permitting authority to states are not subject to section 7's consultation requirement).

[159] 16 U.S.C. § 1536 (2006).

often been reluctant to use section 7 aggressively, instead allowing projects to gradually pile on incremental harms.[160] The complexities of causation create even greater limits for enforcement of section 9 of the ESA,[161] which, according to the Supreme Court, prohibits actions only if they proximately cause harm to discrete, identifiable animals.[162] Perhaps not surprisingly, the ESA therefore has assumed little relevance to urban stream protection,[163] and plaintiffs have fared poorly in the few cases that sought to force the issue.[164]

Despite these limitations, the ESA has occasionally spurred efforts to protect streams from urbanization, and may do so to a greater extent in the future. In Georgia's Etowah watershed, ESA-based restrictions have spurred the ongoing development of a conservation plan likely to involve regulation of impervious cover runoff. [165] Developers have faced similar limitations in parts of the Pacific Northwest, where protected salmon inhabit watersheds impacted by suburban expansion.[166] In Texas, the Edwards Aquifer

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[160] *See* Daniel J. Rohlf, *Jeopardy Under the Endangered Species Act: Playing a Game Protected Species Can't Win*, 41 WASHBURN L.J. 114, 141-42 (2001); J.B. Ruhl, *Keeping the Endangered Species Act Relevant*, 19 DUKE ENVTL. L. & POL'Y FORUM 275, 279, 284-85 (2009).

[161] 16 U.S.C. § 1538 (2006).

[162] Babbitt v. Sweet Home Chapter of Communities for a Great Oregon, 515 U.S. 687, 700 n.13 (1995); *id.* at 708-09 (O'Connor, J. concurring).

[163] In a recent survey, for example, the Center for Watershed Protection found that coastal communities very rarely use the ESA for water quality protection. E-mail from Karen Cappiella, Center for Watershed Protection (January 20, 2009) (on file with author).

[164] *See* Defenders of Conewango Creek v. Echo Developers, LLC, 2007 WL 3023927 (W.D. Pa 2007) (rejecting a challenge to a shopping complex); Center for Biological Diversity v. U.S. Fish and Wildlife Service, 202 F.Supp.2d 594, 597 (W.D.Tex., 2002) (rejecting ESA claims against the Fish and Wildlife Service and a developer that wished "to profit from suburban consumerism by transforming Nature's beauty into upscale shopping venues accompanied no doubt by lovely, non-porous asphalt parking lots over a part of our water supply"); Beaver Dam Assoc. of Stratford, Inc. v. Inland Wetlands and Watercourses Comm'n, 2008 WL 5511259 (Conn. Sup. Ct. 2008) (denying standing to plaintiffs claiming a development would adversely impact downstream water quality).

[165] Etowah aquatic habitat conservation plan, *Etowah aquatic hcp overview*, at http://www.etowahhcp.org/background/overview.htm (last visited October 5, 2009); *see* Seth J. Wenger et al., *Runoff Limits: An Ecologically Based Stormwater Management Program*, STORMWATER, March-April 2008, *available at* http://www.stormh2o.com/march-april-2008/ecologically-stormwater-management.aspx.

[166] *See* Kathie Durbin, *The Costs of Growth; Environment – Saving Salmon Might Change Subdivisions, Hurt Efforts to Limit Sprawl*, COLUMBIAN, November 2, 2001, at 1.

Authority is considering impervious cover limits as part of its efforts to protect the Edwards Aquifer and the springs and streams it feeds;[167] those efforts began largely in response to the requirements of the ESA.[168] While state NDPES program implementation decisions are not subject to ESA section 7, there are some states in which EPA retains permitting authority, and in those states EPA may require dischargers seeking stormwater permit coverage to either certify that their projects will not impact listed species or apply for special permits.[169] Finally, if section 7's prohibition on adverse modification continues emerging from the shadows,[170] it could lead to significant new permitting requirements, for the relationship between impervious cover and aquatic habitat modification is well documented.[171] In short, the ESA, despite some limitations, can be a factor. But it is never likely to be the primary source of protection, and to date, the situations in which it has assumed importance are outliers.

4. Underlying Challenges

As the foregoing discussion indicates, many of the failings of traditional stormwater regulation can be traced to specific provisions of individual laws. But the problems run deeper, for in several ways, urban stormwater presents exactly the kind of

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[167] Edwards Aquifer Authority, Edwards Aquifer Authority Contemplates New Regulations to Strengthen Water Quality Protection, August 11, 2009, *available at* http://www.aquiferguardians.org/eaaimpervlimit.htm.

[168] *See* Sierra Club v. Glickman, 156 F.3d 606 (5th Cir. 1998); Save Our Springs v. Babbitt, 27 F.Supp.2d 739 (W.D. Tex. 1997).

[169] *See, e.g.,* EPA, *supra* note 117, Appendix C at 1.

[170] The adverse modification prohibition has been relatively unimportant because no critical habitat has been designated for most listed species, *see* http://www.fws.gov/Endangered/wildlife.html, and because the implementing agencies' regulations make the adverse modification inquiry essentially superfluous. *See* 50 C.F.R. 402.02 (defining "destruction or adverse modification" and "jeopardy"); Rohlf, *supra* note 160, at 118-19 (criticizing the regulatory approach). Courts have "almost unanimously" held that critical habitat designations are mandatory, however, and have rejected the agencies' regulatory approach. Jason M. Patlis, *Paying Tribute to Joseph Heller with the Endangered Species Act: When Critical Habitat Isn't*, 20 STAN. ENVTL. L.J. 133, 177 (2001); *e.g.* Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service, 378 F.3d 1059, 1069-71 (9th Cir. 2004).

[171] *See supra* Part II.A.

environmental challenge our legal system has traditionally struggled to solve. Scholars often argue that environmental laws do at least moderately well at addressing highly visible, readily understandable problems with discrete, identifiable sources.[172] Untreated toxic effluent from a factory presents a classic example: the harm is palpable and the perpetrator easy to identify, and for the most part, our legal responses have been effective. But when harms are less visible, mechanisms of degradation are harder to understand, and the ultimate cause is the cumulative effect of many small decisions, fashioning effective legal remedies has proven quite challenging.[173]

Urban stormwater presents a classic example of those difficulties. The harms, while not impossible to see, are not nearly as apparent as raw effluent or clouds of visible air pollution. The causal mechanisms are sufficiently hidden and complicated that few people give them much thought, and often one of the first tasks confronted by stormwater managers is conducting some very basic public education.[174] And the underlying cause of harm is the cumulative effect of hundreds of development decisions; ultimately, it is a land use pattern our society collectively has embraced.

Those characteristics suggest that under any legal regime, urban watershed protection would present a substantial challenge. But they also suggest a possibility. From air quality management to climate change mitigation to habitat protection, environmental managers face similar challenges, particularly as relationships between common development patterns and environmental degradation become increasingly

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[172] *See, e.g.,* J.B. Ruhl, *Regulation by Adaptive Management – Is it Possible?*, 7 MINN. J.L. SCI. & Tech. 21, 21-22 (2005) (describing these kinds of challenges as the "low-hanging fruit").

[173] The difficulties we face in addressing climate change illustrate this point.

[174] Zollitsch Interview, *supra* note 115 (explaining that people generally don't understand how stormwater moves, that small individual contributions collectively create significant pollution problems, or even what a watershed is).

clear.[175] If regulators and watershed managers can develop more effective approaches to water quality protection, those approaches could hold lessons for, and perhaps create synergies with, efforts to address a variety of environmental problems.

III. EMERGING APPROACHES

While traditional legal approaches to urban watershed protection have produced mixed results, that traditional regime is evolving. Several of the recent innovations could change, perhaps dramatically, the scope of the NPDES program, the way TMDLs are written, and the form of permitting requirements. In combination, these changes suggest a fundamentally different approach, which relies on information technology, collective permitting schemes, and adaptive management to better address the interactions between landscape attributes and watershed ecology. These emerging approaches would also be backed by some of the most powerful engines of environmental law implementation: federal enforcement authority and citizen suits.[176] Despite these advantages, the emerging approaches would not resolve all of the limitations inherent in older regulatory systems, and they would create some new challenges. But even as partial, incremental reforms, they offer intriguing paths toward better water quality.

A. Impervious Cover TMDLs

One of the main challenges created by the traditional regulatory system is the poor fit between the Clean Water Act's TMDL requirements and the problems facing urban streams. Where multiple sources generate multiple pollution problems, all of

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[175] *See, e.g.*, California Bldg. Industry Ass'n v. San Joaquin Valley Air Pollution Control Dist., 100 Cal. Rptr. 3d 204 (Cal. Ct. App. 2009) (upholding an air pollution district's indirect source rule); Henry Stern, *A Necessary Collision: Climate Change, Land Use, and the Limits of A.B. 32*, 35 ECOLOGY L.Q. 611 (2008).

[176] *See* HOUCK, *supra* note 24, at 64 (describing citizen suits as "the reason American environmental laws work where the similar and often stronger-looking laws of other countries do not"); Barton H. Thompson, *The Continuing Innovation of Citizen Enforcement*, 2000 U. ILL. L. REV. 185.

which synergistically interact to degrade water quality, applying a traditional TMDL-based approach means trying to untangle a Gordian Knot of causes and effects.[177] These challenges are ironic, for the underlying problem—connected impervious cover—is often fairly clear.

To circumvent that problem, regulators in several northeastern states have begun experimenting with "impervious cover TMDLs."[178] These TMDLs use the desired percentage of connected impervious cover in a watershed (minus a margin of error) as a surrogate for determining maximum allowable pollutant loadings.[179] Thus, if an impaired stream drains a watershed with fifteen percent impervious cover, but research suggests that streams in that state need closer to eleven percent effective impervious cover in order to meet relevant water quality standards, the TMDL might identify an effective impervious cover target somewhere below nine percent.[180] Implementing the TMDL then would involve retrofitting existing development and regulating new construction, with the goal of disconnecting much of the existing impervious cover and any new impervious areas.[181]

This approach presents several advantages. First, it simplifies the process of TMDL development. Regulators don't need to go through the extremely time-

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[177] *See supra* Part II.B.2.

[178] *See, e.g.,* CONNECTICUT DEPT. OF ENVTL. PROT., A TOTAL MAXIMUM DAILY LOAD ANALYSIS FOR EAGLEVILLE BROOK, MANSFIELD, CONNECTICUT (2007); FB ENVIRONMENTAL ASSOCIATES, TOTAL MAXIMUM DAILY LOAD (TMDL) REPORT, LOGAN BROOK, AUBURN, MAINE (Draft) (2007); SUSANNE MEIDEL AND MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION, TROUT BROOK TOTAL MAXIMUM DAILY LOAD (TMDL) (2007); SUSANNE MEIDEL AND MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION, BARBERRY CREEK TOTAL MAXIMUM DAILY LOAD (TMDL) (2006); SUSANNE MEIDEL AND MELISSA EVERS, BIRCH STREAM TOTAL MAXIMUM DAILY LOAD (TMDL) (2006).

[179] *See also* VERMONT DEPT. OF ENVTL. CONS., TOTAL MAXIMUM DAILY LOAD TO ADDRESS BIOLOGICAL IMPAIRMENT IN POTASH BROOK (VT 05-11) CHITTENDON COUNTY (2006) (using total stormwater runoff volume as the proxy); NRC, *supra* note 15, at 491-92 (advocating impervious cover TMDLs).

[180] *See, e.g.,* TROUT BROOK TMDL, *supra* note 178, at 17-18.

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

consuming, and perhaps impossible, process of developing defensible pollutant load limits for each individual pollutant.[182] Instead, they may rely on land-cover data—which satellite photos and GIS technology increasingly make available—to assess the overall extent of impervious cover "loading."[183] Second, this approach should be more responsive to the stressors affecting urban watersheds. A pollutant-by-pollutant TMDL would ignore stressors—for example, flashy flow or the loss of riparian habitat—that clearly are important to watershed health, but don't fit within the Clean Water Act's definition of "pollutant."[184] An impervious cover TMDL addresses a key underlying source of those stressors and of traditional pollutants, and therefore can more comprehensively diagnose a watershed's problems.[185] Third, this approach can produce better guidance for land use planners. A conventional TMDL establishes daily mass limits for each relevant pollutant, but managing pollutant loading is not a typical subject of planning school courses. A limit expressed as a cap on impervious cover will be more readily understandable; local planners can intuitively grasp the extent of roofs and pavement in their jurisdictions and the influence of local zoning and building requirements on the amount of impervious cover.[186] An impervious cover TMDL therefore frames the problem so that local governments can start thinking about fixes.[187]

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[182] Evers Interview, *supra* note 25; Witherill interview, *supra* note 25.

[183] *See* Jeff Dennis and Allison Piper, *Summary of the Method Used to Develop an Algorithm to Predict the % Imperviousness of Watersheds*, *at* http://www.maine.gov/dep/blwq/docstand/stormwater/method.pdf (last visited December 16, 2009).

[184] *See* 33 U.S.C. § 1362(6) (2006).

[185] *See supra* Part II.A.

[186] *See* Cloutier Interview, *supra* note 3 (stating that impervious cover TMDLs are helpful for local officials); Arnold, *supra* note 58, at 35 ("The land use planner or regulator … thinks *spatially*.") (emphasis in original).

[187] Even with these improvements, planners won't know all the necessary fixes, for relationships between specific landscape patterns and water quality degradation are only partially understood.

The approach also involves several potential disadvantages. Perhaps most importantly, impervious cover TMDLs are of questionable legality. The appeal of an impervious cover TMDL is that it avoids the inefficiency and futility of pollutant-by-pollutant daily mass limits. But such limits are exactly what the plain language of the Clean Water Act, which demands "total maximum daily loads" for "pollutants," seems to require.[188] And while no court has evaluated impervious cover TMDLs, decisions addressing other parts of section 303 suggest that the judiciary may enforce a literal reading, even where the challenged approach arguably serves the act's underlying goals.[189] States still could draft impervious cover TMDLs that also include pollutant-by-pollutant limits—nothing in the Clean Water Act prevents states from adding additional regulatory requirements or methods—but, by giving up the efficiency inherent in focusing on impervious cover *instead* of individual pollutants, that approach would remove one of the primary benefits of an impervious cover TMDL.

The second potential problem is more practical: there is significant uncertainty about whether achieving the targeted "load" will actually translate into attaining water quality standards.[190] While using impervious cover percentage as a measure of watershed stress has a reasonable scientific basis, at least for small watersheds, data on the effectiveness of mitigation measures still are generally inconclusive.[191] Regulators

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[188] 33 U.S.C. § 1313(d)(1)(A) (2006).

[189] *See* Friends of the Earth v. Envtl. Prot. Agency, 446 F.3d 140 (D.C. Cir. 2006) (rejecting TMDLs that established seasonal or annual loads); Minn. Ctr. for Envtl. Advocacy v. U.S. Envtl. Prot. Agency, 2005 WL 1490331, *5 (D. Minn. 2005) (rejecting a "basinwide TMDL" approach). *But see* Natural Resources Defense Council v. Muszynski, 268 F.3d 91, 99 (2d Cir. 2001) (allowing non-daily loads).

[190] This problem is not unique to impervious cover TMDLs; some traditional TMDLs suffer the same flaw.

[191] CENTER FOR WATERSHED PROTECTION, *supra* note 15, at 3, 9-12 (describing this issue as "[t]he most hotly debated question about the ICM"); Wenger et al., *supra* note 14, at 1085 (identifying several questions related to the effectiveness of treatments).

therefore may be confident that stream impairment is related to the amount of impervious cover in a watershed, but they cannot be sure that the targeted level of retrofits will fix that impairment. Simply setting an impervious cover target also is quite different from setting forth a blueprint for a comprehensive, implementable, and enforceable restoration program. Just as traditional TMDLs usually establish overall load and wasteload allocations without allocating cleanup responsibility to each specific source, impervious cover TMDLs generally have not specified who exactly will go about retrofitting their properties, to what standards, and with what methods.[192] Consequently, impervious cover TMDLs provide much better diagnoses than prescriptions. But an improved diagnosis is still useful, and, for streams impaired by urban stormwater, is more than traditional TMDLs tend to provide. And, as subsequent sections discuss, prescriptions can come from other legal sources.

B. *Residual Designation Authority*

Another key challenge in protecting urban watersheds is the underinclusive nature of the NPDES stormwater program. While that program applies to industrial facilities and to most municipal stormwater systems, it traditionally has ignored private, non-industrial stormwater systems and municipal systems for areas that do not meet the default criteria for inclusion in the permitting program.[193] Consequently, stormwater discharges from many office parks and big box developments, among other exempted sources, are essentially unregulated. Even for permitted facilities, most traditional permits lack effective mechanisms for addressing the impacts of impervious cover.[194]

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[192] *E.g.* TROUT BROOK TMDL, *supra* note 178 (omitting this information); *see* Witherill Interview, *supra* note 25 (noting this limitation of IC TMDLs).

[193] *See* 33 U.S.C. § 1342(p)(2) (2006).

[194] *See supra* notes 97-114 and accompanying text.

The Clean Water Act and EPA's implementing regulations, however, contain a potential—and, considering its historic obscurity, surprisingly powerful—fix for some of these problems. Section 402(p), which defines the stormwater sources subject to and exempt from NPDES regulation, includes a catch-all provision requiring permits for "[a] discharge" that EPA or a state with delegated NPDES permitting authority "determines… contributes to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States."[195] EPA's implementing regulations echo that mandate, and also allow "any person" to petition EPA or a NPDES-implementing state to exercise this "residual designation authority."[196] Once filed, a petition forces EPA or the state to make a determination,[197] and if EPA or the state determines that the stormwater discharge contributes to water quality violations, permitting is mandatory.[198] In other words, the act and its regulations require permitting for any point source that contributes to water quality impairment, whether or not the source is a traditionally-regulated industrial facility, construction site, or municipal stormwater system, and empower anyone to demand enforcement of that requirement.

Although few people have paid attention to this provision,[199] its implications are dramatic. Many—perhaps most—urban watersheds violate water quality standards, and ample research demonstrates that the violations derive largely from stormwater

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[195] 33 U.S.C. 1342(p)(2)(E) (2006).

[196] 40 C.F.R. 122.26(f)(2).

[197] Section 402(p) is structurally similar to section 202 of the Clean Air Act, which requires a determination based on statutory criteria once a petition is filed. *See* Mass. v. EPA, 549 U.S. 497 (2007).

[198] 33 U.S.C. § 1342(p)(2)(E) (2000) (emphasis added). Section 1342(p)(2) exempts some stormwater sources from permitting requirements, but states that this exemption "shall not apply" to stormwater discharges described in subsection 1342(p)(2), including those listed pursuant to subsection (p)(2)(E). Consequently, the normal prohibition on non-permitted point source discharges applies.

[199] No law review articles discuss the subject, EPA's publications rarely refer to it, and I have found only one published decision addressing the use of residual designation authority. *See* In re Stormwater NPDES Petition, 910 A.2d 824 (Vt. 2006).

discharges, many of them currently unregulated.[200] Indeed, the few watersheds where EPA or states have exercised residual designation authority—the upper Charles River in Massachusetts,[201] Long Creek in Maine, and the area surrounding Burlington, Vermont[202]—hardly contain unique landscapes. The upper Charles flows through generic, rapidly-growing fringe suburbs, Burlington contains a fairly typical transition from urban to rural landscapes, and Long Creek's pattern of offices, malls, and roadways recurs across the nation.[203] If residual designation authority applies there, it could apply throughout urban, suburban, or exurban America. Consequently, while EPA and the states have rarely exercised residual designation authority, the rarity of designations derives from administrative reluctance and the absence—perhaps now ending—of citizen suits, not from any limiting provision in the law itself.[204]

Within those watersheds, residual designation authority could dramatically expand the number of permittees. Most owners of developed land in an impaired watershed will own something—a storm sewer system, a drainage ditch, or even a roof drain—that could be characterized as a point source, and that contributes to the waterway's impairment.[205] In other words, most landowners in impaired watersheds

[200] *See supra* Part II.A.

[201] *See* EPA, *supra* note 38.

[202] VT. AGENCY OF NATURAL RES. AND DEP'T OF ENVTL. CONSERVATION, FINAL DESIGNATION PURSUANT TO THE CLEAN WATER ACT FOR DESIGNATED DISCHARGES TO BARTLETT, CENTENNIAL, ENGLESBY, MOREHOUSE AND POTASH BROOKS (2009) *available at* http://www.vtwaterquality.org/stormwater/docs/swimpairedwatersheds/sw_rda_final_determination.pdf.

[203] *See* Interview with Steve Hinchman, Conservation Law Foundation, in Portland, Maine (May 29, 2009) (describing Long Creek as a "poster child for every coastal stream in (southern) Maine").

[204] Sparse monitoring data may also be a factor. *See* EPA, *supra* note 13, at 1 (noting the absence of monitoring data for the vast majority of river and stream miles throughout the country).

[205] 33 U.S.C. § 1362(14) (2006); Rapanos v. United States, 547 U.S. 715, 743 (2006) (noting that a discharge into a conveyance system still can require a NPDES permit).

meet the criteria for NPDES coverage. Some (though not all)[206] of those landowners already are subject to regulation, at least indirectly—their properties may discharge into stormwater systems run by local governments, which in turn are subject to permitting requirements—but residual designation authority raises the possibility that each discharger will be directly and differently regulated.[207] Under the letter of the law, most urban landowners are now potentially covered, and permitting is only an agency decision—or a petition and, perhaps, a lawsuit—away.[208]

C. Collective Permitting

A third set of critiques of existing regulatory approaches argues that even for covered facilities, the permitting requirements are flawed.[209] The prospect of a massive expansion in the NPDES permitting program heightens the importance of these critiques, for residual designation authority might only direct more effort toward a failing approach.[210] But, after years of advocacy from EPA and others, a different permitting system is beginning to emerge, one that could mitigate some of the flaws in traditional permitting approaches.[211] Despite its own complications and limitations, this collective permitting approach offers the prospect of improved regulation.

Recent developments in the Long Creek watershed, where regulators and permittees are experimenting with a single collective watershed permit, illustrate some of

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[206] Because coverage under the NPDES stormwater program depends upon population density, highly urbanized areas with low population density, like commercial districts or office parks, may not be regulated at all. Similarly, private, non-industrial stormwater systems are unregulated.

[207] Residual designation authority may lead to standards more directly focused on impervious cover and also would remove the buffering effect of municipalities, which serve as regulatory intermediaries under the traditional municipal stormwater permitting program. *See supra* note 114.

[208] *See* Virginia S. Albrecht, *Clean Water Act Update*, SR004 ALI-ABA 347 (2009) (describing RDA as "the sleeping giant").

[209] *See supra* Part II.B.1.

[210] That approach also is already severely underfunded. *See* Duhigg, *supra* note 152.

[211] *See, e.g.* COMMITTEE ON WATERSHED MANAGEMENT ET AL., NEW STRATEGIES FOR AMERICA'S WATERSHEDS (1999); U.S. ENVTL. PROT. AGENCY, WATERSHED-BASED NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITTING TECHNICAL GUIDANCE (2007).

that potential.[212] Each regulated landowner[213] in the watershed will choose between buying into the collective permit or seeking individual permit coverage.[214] Joining the collective permit will mean signing a contract obligating that landowner to pay an annual fee for each acre of impervious cover;[215] allowing the newly-created "Long Creek Watershed Management District"[216] access to the landowner's property; and committing the landowner to participation in some collective housekeeping programs.[217] The funding will allow the management district to design and implement a series of restoration projects, which will range from restoration of riparian habitat to installation of stormwater treatment systems.[218] Rather than treating each individual parcel as a separate project with a separate budget, managers will implement projects that offer the greatest environmental return for the lowest financial cost, regardless of where those projects are located.[219] Simultaneously, local land use regulators are heightening controls on new development and will relax some of the existing controls—minimum parking space requirements, for example—that previously encouraged development of impervious area.[220]

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[212] ME. DEPT. OF ENVTL. PROT., GENERAL PERMIT – POST-CONSTRUCTION DISCHARGE OF STORMWATER IN THE LONG CREEK WATERSHED (2009), *available at* http://www.restorelongcreek.org/docs/dep_permit/dep_general_permit_corrected_11-6-09.pdf [hereinafter Long Creek General Permit]; LONG CREEK WATERSHED MANAGEMENT PLAN, *supra* note 5, at 4.

[213] Regulators chose to require permits from only those landowners with at least one acre of impervious cover. *Id.* at 2.

[214] *Id.* at 8.

[215] Landowners can receive credit for stormwater control work they already have completed. LONG CREEK WATERSHED MANAGEMENT PLAN, *supra* note 5, at 71-73.

[216] *See* Long Creek Watershed Management Plan, *supra* note 5, at 74-75; Long Creek General Permit, *supra* note 212, at 5.

[217] Long Creek General Permit, *supra* note 212, at 8 (requiring the contract), 9-10 (describing funding and implementation); *see* LONG CREEK WATERSHED MANAGEMENT PLAN, *supra* note 5, at 26-80.

[218] LONG CREEK WATERSHED MANAGEMENT PLAN, *supra* note 5, at 39-41, 46-60.

[219] *Id.* at 41-42.

[220] *Id.* at 28-33, 43-46.

This approach involves some challenges. The transaction costs are large; regulators and the potential permittees have already spent hundreds of hours developing this conceptual approach and then turning it into a permit and a proposed contract.[221] Fairness concerns are likely. Regulated landowners question the exclusion of smaller landowners and wonder why local residents, who rely on commercial property values to limit their own tax payments, shouldn't pay.[222] If the management district works primarily on a few properties, other owners may wonder if they were relatively small contributors to the watershed's problems and therefore should have paid less.[223] Negotiating access to specific properties could be a sticking point. And governance will sometimes be difficult. Even a small watershed like Long Creek contains many landowners, and coordinating decisions will be an ongoing challenge. In a watershed with more and smaller landowners,[224] the transaction costs and potential for conflicts could be significantly higher.

On the other hand, the potential payoff is huge. By allowing watershed managers to focus on the highest-return projects, a collective approach should save permittees a lot of money.[225] The approach also allows some economies of scale in maintenance projects; a coordinated multi-landowner street sweeping program, for example, should cost much less than the aggregate cost of property-by-property individual efforts.[226] Watershed managers may be able to implement fixes, like riparian habitat restoration or changes to local planning and building codes, that could not occur under a traditional permitting

[221] Participants in the Long Creek process attended, and continue to attend, dozens of meetings.
[222] I heard these concerns repeatedly at public meetings and in more informal conversations.
[223] *See* Interview with Tamara Lee Pinard, Cumberland County Soil and Water Conservation District, Windham, Maine (June 22, 2009).
[224] Because property in Long Creek is largely commercial, there are fewer landowners than in a typical residential urban watershed. LONG CREEK WATERSHED MANAGEMENT PLAN, *supra* note 5, at 10.
[225] *See id.* at 67-68.
[226] *Id.* at 68.

approach.[227] The collective approach can facilitate coordination not just across property but also jurisdictional boundaries; the permit area will cover multiple towns, thus partially avoiding the common problems created by mismatches between watershed and political boundaries.[228] The project will not be cheap, but these advantages should produce significant cost savings.[229] Preliminary estimates suggest a sixty percent or greater reduction in costs.[230]

The collective permitting approach also creates a different dynamic among landowners. Instead of placing each permittee in a separate relationship with regulatory authority, the collective permit can create a sense of collective responsibility among permittees.[231] If several landowners neglect to pay into the fund or to allow access to their land, other landowners will need to pay more, and they therefore have a collective incentive to police their fellow permittees.[232] That dynamic already seems to have had salutary effects. First, the prospect of implementing an approach that could collectively save money inspired members of the business community to work hard to promote the process.[233] Second, business community members already have engaged and continue to engage in serious conversations about ways to police compliance and to cooperate on restoration.[234]

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[227] *Id.* at 68.

[228] *See generally* Arnold, *supra* note 16.

[229] LONG CREEK WATERSHED MANAGEMENT PLAN, *supra* note 5. at 62-71.

[230] John Richardson, *Long Creek Cleanup Rolls Toward Reality*, PORTLAND PRESS HERALD, January 14, 2010, at B1 (contrasting $3,000/acre estimated costs for the collective permit with $7,000 to $10,000 per acre costs for individual permits).

[231] I base this statement on observation of landowner meetings.

[232] In comments on an earlier draft, Curtis Bohlen pointed out this dynamic.

[233] *See* Interview with David Russell, Engineer, Fairchild Semiconductor, South Portland, Maine (June 17, 2009) (describing his role); Interview with Paul Ureneck, Boulos Properties, Portland, Maine (July 7, 2009).

[234] I base this assertion on comments at public meetings and on extended email correspondence addressing the content of the participating landowner agreement.

Finally, while the initial transaction costs may be quite high, the Long Creek process provides an important learning opportunity.[235] The creation of multiple committees and sub-committees has created forums for dialogue among permittees, and between permittees, towns, and regulators, providing important opportunities for exchanging information. The centralized administrative structure also allows a coordinated monitoring strategy, which should better allow for adaptation as the project proceeds.[236] Through that monitoring and documentation of procedures and results, the Long Creek effort also could provide a useful example for other watersheds; indeed, multiple participants expressed the hope that the process would create, as one put it, a "replicable model for how to restore an impaired urban watershed."[237]

While in some ways unique, the Long Creek process is in other ways representative of a broader trend.[238] EPA, National Research Council panels, and other groups have been advocating "watershed-based permitting" for years, and that advocacy has slowly but increasingly begun to result in real-world experiments.[239] In Georgia's Etowah Watershed, for example, local governments are developing a habitat conservation plan in some ways similar to the Long Creek permit.[240] Other areas have experimented with stormwater utilities, which impose service charges on all entities served by a water

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[235] *See* Pinard Interview, *supra* note 223 ("I learn more every day.").

[236] *See* LONG CREEK WATERSHED MANAGEMENT PLAN, *supra* note 5, at 61-65. Because of high monitoring costs, data availability may pose significant challenges for adaptive management.

[237] *See* Hinchman Interview, *supra* note 203. Government officials often express a desire to incorporate some elements of the Long Creek process but to use stormwater utilities rather than permitting processes. *E.g.* Telephone Interview with John Murphy and Wendy Warren, City of Bangor (December 17, 2009).

[238] *See* Witherill Interview, *supra* note 25 (noting that the approach "springs from basic watershed planning principles").

[239] *See supra* note 211.

[240] *See* Etowah habitat conservation plan, *supra* note 165.

or wastewater utility and use the revenues to fund stormwater management activities.[241] The Long Creek process involves more intensive and expensive effort than many of these other projects,[242] but it still reflects a broader shift toward using innovative permitting approaches to allow watershed-scale remediation.

The benefits of these alternative approaches should not be overstated. Permit compliance still will cost money, and transaction costs may sometimes make these alternative approaches completely untenable. Indeed, there probably are reasons beyond mere inertia why so few watershed permitting processes have developed despite EPA's sustained promotion of the idea.[243] But the gradual emergence of these approaches does at least suggest the prospect of a feasible, if not easy, way to cost-effectively integrate more landowners into regulatory processes, and thus to begin addressing the water quality impacts of development patterns.

D. The Combination

In isolation, each of these changes might be ineffectual or even problematic. Impervious cover TMDLs could just identify problems while prescribing only unworkably general cures.[244] Residual designation authority, while powerful, cannot be

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[241] *See* Brisman, *supra* note 40 (describing such programs); *see also* CENTER FOR WATERSHED PROTECTION, *supra* note 148, at 21, 23 (describing programs funded by impervious cover fees).

[242] *Compare* Elizabeth Treadway and Andrew L. Reese, *Financial Strategies for Stormwater Management* (2000), *available at* http://stormwaterfinance.urbancenter.iupui.edu/PDFs/Treadway.pdf (describing annual stormwater management costs, even for "advanced" programs, of $90 - $150/acre *with* LONG CREEK WATERSHED MANAGEMENT PLAN, *supra* note 5, at 70 (estimating annual costs of $2,500 - $3,000 per acre, even with the savings from collective permitting).

[243] The rarity of such programs is perhaps best illustrated by the case studies on EPA's watershed permitting page. Few actually involve efforts to address all sources in a watershed. *See* Envtl. Prot. Agency, Watershed-Based NPDES Permitting Overview, at http://cfpub.epa.gov/npdes/wqbasedpermitting/wspermitting.cfm (last visited January 26, 2010) (providing links to case studies).

[244] *See supra* notes 191-192 and accompanying text.

invoked without a watershed-specific evidentiary basis.[245] If widely invoked, it also could overwhelm the NDPES program with a flood of new permittees. Collective watershed-based permitting, standing alone, is an aspiration without a supporting mandate. The whole point of watershed-based permitting is to address the full range of stressors affecting a watershed,[246] but sources without permitting obligations have no incentive to participate. In combination, however, these approaches move toward an improved regulatory system. The combination isn't perfect—in some ways, it leaves excessive discretion, and in others it may be too onerous[247]—and many other possible measures exist.[248] But this particular combination is a useful starting point for contemplating more comprehensive reform.

To understand the significance of the shift, one must first reconsider the two traditional regulatory approaches to water pollution control. The NPDES approach treats most permitted facilities like pipes abstracted from environmental context, [249] with little attention paid to the development patterns on the permittee's property or on adjacent land. While that approach has worked well for discrete pollutant sources amenable to end-of-the-pipe technological controls—in practice, industrial and municipal wastewater discharges—it has accomplished little when landscape patterns are central to pollution

[245] *See* 33 U.S.C. § 1342(p) (2006) (mandating designations if EPA "determines that the stormwater discharge contributes to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States"). Such a determination would require factual support.

[246] *See* EPA, *supra* note 243 ("Watershed-based NPDES permitting… emphasizes addressing all stressors within a hydrologically-defined drainage basin…").

[247] *See infra* Part V.A (discussing possibly excessive emphasis on highly urbanized areas).

[248] *See supra* Part II.B.3 (discussing some innovative state and local programs); NRC, *supra* note 15, at 475-555 (advocating other reforms).

[249] According to many, that abstraction represents not a failing but a stroke of genius, for it greatly reduces the informational demands placed on regulators. *E.g.* HOUCK, *supra* note 24, at 63; Wendy E. Wagner, *The Triumph of Technology-Based Standards*, 2000 U. ILL. L. REV. 83; Sidney A. Shapiro & Thomas O. McGarity, *Not So Paradoxical: The Rationale for Technology-Based Regulation*, 1991 DUKE L.J. 729, 739-51.

problems.[250] The TMDL/planning approach does consider landscape patterns and environmental context, but it demands an unrealistic level of scientific understanding, and it is nearly toothless.[251] Consequently, there is no straightforward way, if regulators use traditional approaches, to address landscape-derived pollution through a manageable and mandatory set of controls. Nor can citizen suits force regulators to that endpoint.

An effective system of controls on landscape-based pollution would be quite differently constructed. It would require regulators to diagnose situations where land use patterns are causing pollution problems;[252] would contain a method for linking those diagnoses to permits on specific sources; and would include some way of writing effective controls into those permits.[253] The system as a whole would be at least moderately efficient and fair, lest recalcitrant permittees and reluctant regulators stymie implementation.[254] Its evidentiary demands would not outstrip the capacity of watershed scientists to supply information.[255] The system would provide opportunities for motivated and innovative people to creatively craft their own solutions.[256] Because of the substantial uncertainty inherent in water quality planning, it also would create mechanisms for adaptive learning and adjustment.[257] And the system probably would empower outside parties to compel regulation when regulators are underfunded,

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[250] *See supra* Part II.B.1.

[251] *See supra* Part II.B.2.

[252] Section 4 of the ESA, which creates a process for assessing the status of species and allows citizen petitions to force initiation of that process, provides a useful analogy. *See* 15 U.S.C. § 1533 (2006).

[253] The Clean Air Act's ambient air quality approach does this through its SIP requirements, which, though sometimes criticized, have produced stronger results than the Clean Water Act's water quality provisions. *See* Dave Owen, *Probabilities, Planning Failures, and Environmental Law*, 84 TULANE L. REV. 265, 280-81 (2009).

[254] *See, e.g., See* John P. Dwyer, *The Pathology of Symbolic Legislation,* 17 ECOLOGY L.Q. 233 (1990) (describing EPA's reluctance to implement programs it deemed overly stringent).

[255] *See* Wagner, *supra* note 23, at 193 ("competent regulatory design requires an assessment of what science and other sources of technical information can and cannot offer").

[256] For an interesting proposal, see Bradley C. Karkkainen, *Adaptive Ecosystem Management and Regulatory Penalty Defaults: Toward a Bounded Pragmatism*, 87 MINN. L. REV. 943 (2003).

[257] *See* SHABMAN ET AL., *supra* note note 125.

politically constrained, or otherwise reluctant to act.[258] Absent any of those elements, the system would likely prove unworkable.

The new approaches come closer to that more effective system. Although a TMDL is neither the only nor, perhaps, the best method of arriving at a diagnosis, the TMDL process does at least compel states to figure out why waterways are impaired.[259] And while fulfilling that obligation normally is difficult when urban stormwater is the key stressor, impervious cover TMDLs create a feasible and relatively efficient method for reaching those diagnoses. TMDLs normally create little compulsion for treatment, but the possibility of residual designation authority significantly changes the equation. If a TMDL identifies aggregate impervious cover levels as underlying causes of water quality impairment, then every landowner with point source discharges from impervious cover is responsible for contributing to those water quality violations, and the evidentiary basis exists for a residual designation.[260] The default next step—individualized permitting of every owner of impervious cover in the watershed—would likely be unworkable, but collective permitting offers the prospect of a more collaborative, adaptive, cost-effective, and administratively streamlined approach. In short, impervious cover TMDLs and permitting provisions can provide mandatory steps from diagnosis to enforceable permit, and watershed-based permitting provides a way of making the permitting actually work.

This particular combined system is by no means a perfectly constructed model. By avoiding monitoring, states may avoid even identifying impaired urban streams.[261]

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[258] *See* HOUCK, *supra* note 24, at 204-05.
[259] *See* 33 U.S.C. § 1313(d) (2006).
[260] *See id.* § 1342(p).
[261] *See* EPA, *supra* note 13, at 1 (documenting the sparse extent of monitoring).

States have no legal obligation—and even have significant legal impediments in the current language of the Clean Water Act—to prepare impervious cover TMDLs.[262] The requirements of NPDES permits for residual designation authority sources aren't clearly specified by the statute,[263] and while EPA and the states could write permits with genuine constraints, they also might imitate the general, hortatory, and largely unenforceable permits widely used for many traditionally-regulated stormwater sources.[264] Finally, there is an element of a bluff in any state or federal threat to exercise residual designation authority across the landscape. Absent the use of watershed permitting, stormwater utilities, or some other system that creates administrative efficiency and economies of scale, few states or EPA offices could oversee a comprehensive permitting program—particularly for residential watersheds, where regulators might face the distasteful prospect of requiring NPDES permits from individual houses.[265] For all these reasons, the combination of approaches probably is a set of steps toward a better regulatory system, nota finished product. But even with these limitations, the alternative system still improves upon the traditional and almost entirely ineffective approach of leaving urban stream protection and restoration dependent upon sporadic displays of state or local initiative.

IV. FEDERALIZING THE LANDSCAPE?

[262] *See supra* notes 188-189 and accompanying text. TMDLs written using traditional methods still may create sufficient documentation to trigger residual designation authority, but because traditional methods probably will not explain as clearly the links between impervious cover and degradation, the documentation isn't likely to be as compelling.

[263] Section 402(p) does not specify standards for sources permitted pursuant to residual designation authority.

[264] *See* Wagner, *supra* note 23.

[265] *See* Wagner, *supra* note 23, 191 (describing the massive scale of the stormwater regulatory program *without* RDA permittees).

While the combination of mechanisms described above may represent a promising shift, the core insight upon which that shift rests—that protecting water quality often means regulating landscape and development patterns—creates potential conflict with a commonly-expressed vision of environmental federalism.[266] That conflict could doom the new regulatory model, no matter how sensible it might be, for the traditional view has become powerful and deeply entrenched. This section therefore explains why that common federalism approach, though appealing, could in this context produce unfortunate outcomes.

A. Prevailing Fears

For decades, Congress has often signaled that land use planning is a state or local prerogative. In the 1970s, proposed federal land use planning laws almost all failed to secure passage, and administrative efforts to control pollution through land use regulation met their demise amid vociferous political opposition.[267] In the Clean Water Act, Congress made a show of bowing to those preferences; it asserted its intent "to recognize, preserve, and protect the primary responsibilities and rights of the States… to plan the development and use… and land and water resources."[268] While the act's substantive provisions have imposed limits upon that authority—wetlands protections, for example, clearly affect land development—the idealization of local land use planning has continued to dominate Congressional rhetoric. For decades, the preferred battle cry against any expansion in the Clean Water Act's scope has been to warn of plots "to give

[266] *See* Cloutier Interview, *supra* note 3 (acknowledging that, in practice, stormwater management means controlling people's use of land).

[267] *See* A. Dan Tarlock, *Land Use Planning: The Weak Link in Environmental Protection*, 82 WASH. L. REV. 651, 656 (2007); Patrick Del Duca and Daniel Mansueto, *Indirect Source Controls: An Intersection of Air Quality Management and Land Use Regulation*, 24 LOY. L.A. L. REV. 1131 (1991).

[268] 33 U.S.C. § 1251(b) (2006).

federal bureaucrats authority to make final decisions about local land use."[269] And the preferred defense has been to argue not that federal law has some role to play in land use decisions, but instead that federal law remains safely on the environmental side of the great divide.[270]

The Supreme Court has carried the same tune, sometimes with equal vigor. The Court has insisted that environmental regulation and land use law occupy distinct and separate realms.[271] It also has suggested that this distinction holds constitutional significance, with federal regulation that strays too far into the realm into land use potentially suspect.[272] Meanwhile, judicial defenders of federal water quality protection, much like the Congressional advocates of water quality legislation, sometimes seem to

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[269] *Nominations of Lisa Jackson to be Administrator of the U.S. Environmental Protection Agency & Nancy Helen Sutley to be Chairman of the Council on Environmental Quality*, 111th Cong. (2009) (opening statement of James Inhofe, Senate Environmental and Public Works Committee) (describing the Clean Water Restoration Act and possible ESA reforms). Older debates are filled with similar rhetoric. *See, e.g.*, 133 Cong. Rec. 1558, 1598 (1987) (testimony of Sen. Dole) ("S. 1 proposes Federal land use planning. My substitute leaves it to the States.); 133 Cong. Rec. 1558, 1569 (1987) (testimony of Sen. Symms) ("This mandatory program smells of land-use planning."). In vetoing proposed legislation, President Reagan voiced similar themes: "…the agency will be able to become a major force in local zoning decisions that will determine whether families can do such basic things as build a new home. That is too much power for anyone to have, least of all the Federal Government." Letter from Ronald Reagan, U.S. President, Message to the House of Representatives Returning Without Approval the Water Quality Act of 1987 (Jan. 30, 1987), *available at* http://www.reagan.utexas.edu/archives/speeches/1987/013087f.htm.

[270] *See, e.g.,* 133 Cong. Rec. 1437, 1465, (1987) (testimony of Sen. Mitchell) ("…the distinguished minority leader referred to the nonpoint provision of this bill as 'Federal land use planning.' This is a serious charge. It is an erroneous charge."); 133 Cong. Rec.1558, 1581 (1987) (testimony of Sen. Durenberger) ("it was said by some that H.R. 1 was a Federal land use planning bill . . . . Well, Mr. President, nothing could be further from the truth.").

[271] *See California Coastal Commission v. Granite Rock Co.,* 480 U.S. 572, 587 (1987) ("Land use planning in essence chooses particular uses for the land; environmental regulation, at its core, does not mandate particular uses of the land but requires only that, however the land is used, damage to the environment is kept within prescribed limits."). *But see id.* at 602-05 (Powell, J. dissenting) (questioning this distinction).

[272] Rapanos v. U.S., 547 U.S. 715, 738 (2007) ("The extensive federal jurisdiction urged by the Government would authorize the Corps to function as a *de facto* regulator of immense stretches of intrastate land… the Corps' interpretation stretches the outer limits of Congress's commerce power and raises difficult questions about the ultimate scope of that power."); Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers, 531 U.S. 159, 173 (2001) ("Permitting respondents to claim federal jurisdiction over ponds and mudflats falling within the "Migratory Bird Rule" would result in a significant impingement of the States' traditional and primary power over land and water use.").

concede the inappropriateness of federal regulation of land uses, and instead assert that the Clean Water Act appropriately sticks to environmental protection.[273] The Court has been far from consistent in asserting this distinction, and justices have stated, sometimes clearly and sometimes not, that Congress may trump local land use authority wherever the Commerce Clause permits.[274] These federalism intuitions also have yet to coalesce into any sort of discrete legal standard, and may never do so.[275] But the overall message—albeit a mixed one—is that courts may question any regulatory initative that extends federal law any further into the realm of land use planning.

Some of this legislative and judicial skepticism clearly derives from an anti-regulatory agenda, and many statements suggest at least as much offense at the substance of regulatory programs as at their source.[276] But the rhetoric also foreshadows a genuine clash between the emerging controls on landscape-derived water pollution and a prominent vision of federalism, in which liberty, responsive government, civic engagement, and experimentation all are promoted by cabining federal authority in limited and discrete spheres,[277] land use regulation not among them. It also tracks broader themes voiced in academic literature, which often portrays federal environmental

[273] *E.g. SWANCC*, 531 U.S. at 191 (Stevens, J. dissenting) ("[t]he CWA is not a land-use code; it is a paradigm of environmental regulation. Such regulation is an accepted exercise of federal power.").

[274] *See, e.g.,* Hodel v. Virginia Surface Min. and Reclamation Ass'n, Inc., 452 U.S. 264, 275-77 (1981) (rejecting a challenge to federal mining regulation); *id.* at 305 (Powell, J. concurring) (asserting that the Commerce Clause allows even "an extraordinarily intrusive program of federal regulation and control of land use and land reclamation, activities normally left to state and local governments").

[275] The *Rapanos* and *SWANCC* decisions, for example, clearly indicate that federalism concerns will inform at least some justices' application of constitutional theories to water quality regulation, but exactly how is far from clear.

[276] *See Rapanos*, 547 U.S. at 549 U.S. at 721 ("[t]he burden of federal regulation on those who would deposit fill material in locations denominated 'waters of the United States' is not trivial").

[277] *See, e.g.* U.S. v. Morrison, 529 U.S. 598, 617-18 (2000) ("The Constitution requires a distinction between what is truly national and what is truly local"); Gregory v. Ashcroft, 501 U.S. 452, 457-60 (1991).

regulation as blunt, inefficient, rigid, and litigious[278] and identifies local governance as the desirable ideal.[279] Most academic critiques are more nuanced than the political broadsides and often support different fixes; many of the most prominent academic critics of traditional federal environmental regulation prefer a shift toward incentive-based regulation rather than systematic devolution to state control.[280] But the aggregate impression one could easily take from these political, judicial, and academic dialogues is that any extension of the Clean Water Act's reach, or the reach of any other federal environmental statute, into land use planning will be the antithesis of good-government reform. An extension spurred by litigation would be even worse.[281]

All of this may sound compelling in theory. But actual practice provides an important test. And while one case study obviously cannot prove a general point, a return to Long Creek, where residual designation authority already has dramatically extended the Clean Water Act's reach, can shed some light on the theoretical case against federal expansion. To date, what has actually happened is quite different from what prevailing federalist theory would predict.

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[278] *See, e.g.*, Richard B. Stewart, *Environmental Quality as a National Good in a Federal State*, 1997 U. CHI. L. F. 189, 193, 194 (describing the federal environmental law system as "burdensome, top-heavy" and asserting that the "existing system of centralized federal command-and-control regulation and liability… displays many grievous flaws. These include excessive rigidity and cost, barriers to innovation, lack of democratic political accountability, skewed priorities, excessive delay and transaction costs, and excessive legalization"); Sunstein, *supra* note 94, at 626-30 ("A large source of regulatory failure in the United States is the use of rigid, highly bureaucratized 'command-and-control' regulation."); *see generally* John O. McGinniss, *Reviving Tocqueville's America: The Rehnquist Court's Jurisprudence of Social Discovery*, 90 CALIF. L. REV. 485, 490-91 (2002) (arguing that "[t]he Rehnquist Court's jurisprudence reflects a more skeptical view of centralized democracy" and strives to increase civic involvement by returning power to local institutions).

[279] *E.g.* Hunter Lovins and Amory Lovins, *Foreword*, in BEYOND BACKYARD ENVIRONMENTALISM viii-ix (Joshua Cohen and Joel Rodgers, eds. 2000) ("environmental problems… should be solved by people with local expertise"); Sunstein, *supra* note 94, at 626 ("Local decisions inculcate a sense of responsibility in citizens and encourage participation far more effectively than centralization.").

[280] *See, e.g.,* Richard B. Stewart, *Madison's Nightmare*, 57 U. CHI. L. REV. 335, 351-52 (1990)

[281] *See* Friends of the Earth, Inc. v. Laidlaw Environmental Services (TOC), Inc., 528 U.S. 167, 209-210, 215 (1999) (Scalia, J. dissenting) (criticizing citizen suits).

B. Practical Realities

Until the latter part of the last decade, federal environmental law played little role in the development of the Long Creek watershed. Land use development occurred primarily at the local level.[282] Nor was there much public involvement in those planning decisions. South Portland in particular[283] was a developer's town, a place where local government courted businesses and citizen involvement in planning decisions was minimal.[284] What emerged in the Long Creek watershed was neither a distinctive land use pattern nor a particularly hospitable one.[285] A visitor dropped down amid the watershed's malls and offices would have no clue where in America he was—an ironic result in a state that takes pride in achieving a distinctive quality of place.[286]

State and local governments did at times express concerns about stormwater runoff and water quality, but their concerns produced few results. In the 1970s and 1980s, as development was booming, regulators imposed some controls designed to limit flooding.[287] Later, Maine DEP used federal funding to conduct a comparative study assessing differences between Long Creek and a neighboring, mostly undeveloped watershed. The study demonstrated that Long Creek had markedly reduced biodiversity and increased pollutant levels.[288] But, at least initially, regulatory controls did not

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[282] *See* Blake Interview, *supra* note 37 (explaining that federal and state law for years had little effect on development).

[283] Four municipalities share the watershed, but most development is in South Portland. *See* http://www.restorelongcreek.org/maps/Long_Creek_Watershed.pdf.

[284] *See* Blake Interview, *supra* note 37.

[285] Walking around the area is not easy. The absence of sidewalks suggests a landscape designed exclusively for automobiles.

[286] *See* THE BROOKINGS INSTITUTION, CHARTING MAINE'S FUTURE 6 (2006) (describing the Maine "brand").

[287] *See* Ureneck Interview, *supra* note 233 (describing stormwater management efforts in the early 1980s; "none of it worked").

[288] MAINE DEPT. OF ENVTL. PROT., *supra* note 5; U.S. EPA, *supra* note 5.

follow.[289] Local government representatives were also concerned about the watershed's land use pattern, but had not figured out how to induce change.[290]

A few years after the studies, however, circumstances shifted dramatically. In 2007, the City of South Portland, with the support of other towns and Maine DEP, initiated a collaborative planning process to address water quality problems in Long Creek.[291] Using federal grant money, the participants hired a professional facilitator, who drew in additional participants, and they secured sustained involvement from the local chamber of commerce and from many of the watershed's largest public and private landowners.[292] Over several years, and through many meetings, they developed the collective permitting approach described above, and now are finalizing permits and contracts, securing landowner participation, and beginning implementation.[293]

Participants consistently describe the process as something special, a demonstration of the positive potential of local collaboration. The mutual respect among the participants is striking. In interviews, they consistently praised fellow participants, including people who might normally have been their adversaries.[294] While collaborative

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[289] The state was engaged in identifying impaired urban streams and in developing new regulatory controls on stormwater. *See* Maine Department of Environmental Protection, *supra* note 149.

[290] *See* Interview with Jim Hughes, South Portland City Councilor, in South Portland, Maine (June 17, 2009).

[291] Witherill Interview, *supra* note 25.

[292] *Id*.; Cloutier Interview, *supra* note 3.

[293] *To be updated as article goes to press.*

[294] *See, e.g.,* Witherill Interview, *supra* note 25 (praising several landowners, and also noting the importance of Curtis Bohlen's financial work); Ureneck Interview, *supra* note 233 ("extremely open forum," "no hidden agendas," "diverse group of participants who were trying to make it work"); Russell Interview, *supra* note 233 ("extremely impressed with cooperation among municipalities"); Hinchman Interview, *supra* note 203 ("very progressive approach" taken by South Portland, the state, and several businesses); Cloutier Interview, *supra* note 3 (describing Hinchman as the "consummate attorney"); Hughes Interview, *supra* note 290 (mentioning the Chamber of Commerce's Chris Hall as a particularly constructive participant); Interview with Chris Hall, Greater Portland Chamber of Commerce, Portland, Maine (July 7, 2009) (describing "extraordinary efforts" to bring landowners into the dialogue); Interview with Curtis Bohlen, Casco Bay Estuary Partnership, in South Portland, Maine (June 5, 2009) (praising CLF for simultaneously forcing and constructively supporting the process). The paid facilitator hired by the group also received universal praise.

environmental management may sometimes produce warm feelings but few results, here the outcomes, while still works in progress, justify the participants' enthusiasm. The participants' watershed-based permitting approach is genuinely innovative, could produce real environmental benefits at significant cost savings, and could provide a template for restoration efforts elsewhere in the state or nation.

All those positive outcomes did not occur, however, because of cabined federal authority or because of the absence of traditional legal levers. EPA was minimally involved, other than to provide grant funding.[295] But the participants generally concurred—some grudgingly, others emphatically—that few positive outcomes would have occurred had the Conservation Law Foundation (CLF), a regional environmental group, not threatened to invoke federal law by filing a residual designation authority petition.[296] Similarly, most participants agreed that CLF's decision to actually file the petition helped focus the collaborators' efforts.[297] That decision ruffled some feathers, but it strengthened regulators' hands and created a sense of urgency for the potential permittees, providing an incentive for everyone to stay at the table.[298] One anecdote summarizes the importance of that federal lever: a city councilmember told me that at a watershed tour early in the process, he had encouraged a CLF attorney to file suit, on the theory that it would take a legal obligation to motivate local action.[299]

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[295] *See* Witherill Interview, *supra* note 25.

[296] Bohlen Interview, *supra* note 294; Hughes Interview, *supra* note 290. Pending litigation in Vermont added credibility to that threat, particularly after CLF won. *See* In re Stormwater NPDES Permit Petition, 910 A.2d 824 (Vt. 2006); Ureneck Interview, *supra* note 233 (stating that participants were aware of this litigation).

[297] *E.g.* Witherill Interview, *supra* note 25 (noting that the filing created discord but "probably helped the process"); Cloutier Interview, *supra* note 3 (calling the filing a "bump in the road," but acknowledging that "CLF needed to keep the heat on" or risk the process falling apart).

[298] *See* Pinard Interview, *supra* note 223; Witherill Interview, *supra* note 25, Cloutier Interview, *supra* note 3.

[299] Hughes Interview, *supra* note 290.

The Long Creek process does support some aspects of the traditional federalist vision described above. It shows that real environmental management expertise and creative potential exist at local levels; that some private companies can and will constructively embrace environmental restoration efforts;[300] and that collaboration can produce not just a more satisfying process but also substantive results.[301] The Long Creek story also provides reminders that even if legal threats may sometimes be necessary prerequisites for successful collaboration, they are rarely sufficient; by all accounts, the expertise, patience, and diplomacy of many participants, including the same attorneys who were creating the legal threat, was essential to the group's success.[302] And, obviously, this story does not, by itself, prove a general point. Long Creek is just one watershed, and in some ways a distinctive one.[303]

But what happened in Long Creek is consistent with a broader trend identified throughout much of the literature on watershed protection and environmental governance. Federal law, sometimes invoked by environmental groups threatening or actually filing lawsuits, has often triggered, not squelched, local creativity. Innovative restoration processes on the Sacramento and San Joaquin Rivers,[304] the Columbia River,[305] the

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[300] *See, e.g.*, Russell Interview, *supra* note 233 (explaining that his company viewed the process as consistent with a corporate commitment to environmental responsibility); Hall Interview, *supra* note 294 (explaining that the local business community valued environmental quality).

[301] For extensive discussion of the potential of such collaboration, see JULIA M. WONDOLLECK AND STEVEN L. YAFFEE, MAKING COLLABORATION WORK: LESSONS FROM INNOVATION IN NATURAL RESOURCE MANAGEMENT (2000).

[302] *See supra* note 294.

[303] A more residential watershed would create obvious difficulties. And a watershed with a different political climate also would be more challenging. Not every chamber of commerce views environmental protection and economic development as largely synonymous.

[304] *See* Elizabeth A. Rieke, *The Bay-Delta Accord: A Stride Toward Sustainability*, 67 U. COLO. L. REV. 341, 342 (1996).

[305] *See* KAI N. LEE, COMPASS AND GYROSCOPE: INTEGRATING SCIENCE AND POLITICS FOR THE ENVIRONMENT (1993) (describing foundational experiments in adaptive management, which began partly in response to the Endangered Species Act).

Platte,[306] the Everglades,[307] and the Kennebec River,[308] to provide just a few examples, all started under the pressure of federal law and often at least partially in response to actual or threatened litigation. States do not always need a federal push to act, of course; sometimes states pursue innovative approaches despite federal inactivity or even opposition.[309] But the stories are legion, particularly in the field of water law, of federal law's absence (or non-enforcement) producing not innovation but homogenous inertia.[310]

That trend suggests that the standard federalism rhetoric is missing something important. A core premise of that rhetoric is that federal disengagement correlates with local involvement and innovation.[311] No doubt that is sometimes true. But sometimes federal disengagement may just provide space for different national-scale actors—in Long Creek, for example, the national chains that occupy much of the watershed—to impose standardized development patterns, or for local businesses, city governments, and highway agencies to copy cookie-cutter approaches developed elsewhere. Federal law, in other words, isn't the only potential source of uniformity, and the absence of federal law does not necessarily mean robust local engagement. And if federal law applies, as it often does, while creating opportunities for local involvement, it may inspire and

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[306] *See* Joseph L. Sax, *Environmental Law at the Turn of the Century: A Reportorial Fragment of Contemporary History*, 88 CAL. L. REV. 2375, 2395 (2000).

[307] *See* U.S. v. South Florida Water Mgmt. Dist., 847 F. Supp. 1567 (S.D. Fla. 1992) (approving a consent decree in litigation that helped spur the Everglades restoration process).

[308] *See* Michael C. Blumm and Viki A. Nadol, *The Decline of the Hydropower Czar and the Rise of Agency Pluralism in Hydroelectric Relicensing*, 26 COLUM. J. ENVTL. L. 81, 117-21 (2001) (describing the Edwards Dam's removal).

[309] *See, e.g.,* Kirsten Engel, *State and Local Climate Change Initiatives: What is Motivating State and Local Governments to Address a Global Problem and what Does this say about Federalism and Environmental Law?,* 38 URB. LAW. 1015 (2006).

[310] *See, e.g.,* HOUCK, *supra* note 24, at 63 (describing nearly complete inaction on water quality planning prior to the initiation of citizen suits under the Clean Water Act); William L. Andreen, *The Evolution of Water Pollution Control in the United States—State, Local, and Federal Efforts, 1789-1972: Part I*, 22 STAN. ENVTL. L.J. 145 (2003).

[311] *See, e.g.,* McGinniss, *supra* note 278.

empower local individuals or groups to create diversity and innovation, which are exactly the things a federalist system is supposed to promote.[312]

The Long Creek experience thus demonstrates, at the very least, that the standard federalist rhetoric isn't always right. And it provides a strong data point in support of alternative views emerging in recent academic work. Whether termed adaptive federalism, modular regulation, or something else, these alternative conceptual approaches emphasize overlapping authority as a precondition for intergovernmental dialogue and innovation.[313] They suggest that creativity thrives when we empower different levels of government to work together, and work with environmental groups and private sector businesses, subject to some background constraints supplied by federal law.[314] They thus provide theoretical counterpoints to the prevalent view that federalism functions best as a system of separating boundaries. The Long Creek process provides empirical evidence of those alternative approaches producing positive results.

V. TRIAGING WATERSHEDS

While the Long Creek process was unfolding, another Maine city was beginning its own urban stream restoration project. Birch Stream, which flows through Bangor, Maine, is not a prominent community resource. An airport and a mall cover much of the watershed, and Birch Stream emerges from culverts only half a mile from its point of

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[312] *See* New State Ice Co. v. Liebmann, 285 U.S. 262, 310-11 (1932) (Brandeis, J., dissenting) ("It is one of the happy incidents of the federal system that a single courageous state may, if its citizens choose, serve as a laboratory.").

[313] *See, e.g.,* William W. Buzbee, *Interaction's Promise: Preemption Policy Shifts, Risk Regulation, and Experimentalism Lessons*, 57 EMORY L.J. 145, 157 (2007) ("Handing all regulatory power to one actor is the antithesis of the diversity of actors called for in experimentalist literature."); David E. Adelman and Kirsten H. Engel, *Adaptive Federalism: The Case Against Reallocating Environmental Regulatory Authority*, 92 MINN. L. REV. 1796, 1796-1800 (2008); Jody Freeman and Daniel A. Farber, *Modular Environmental Regulation*, 54 DUKE L.J. 795 (2005).

[314] *See, e.g.,* Arnold, *supra* note 16, at 310-11.

discharge.[315] A few residences occupy the lower watershed, but no public walkways follow the stream's banks.[316] A longtime local water manager told me that he had never known the waterway was anything more than a drainage ditch.[317] But in the eyes of the law, Birch Stream is just as important as a longer, more accessible urban stream, and its failure to attain water quality standards is legally problematic. The state of Maine has prepared a TMDL for the watershed, [318] and the city of Bangor already has spent approximately five million dollars on restoration work, with more to come.[319]

Birch Stream highlights different questions about urban watersheds—questions that assume greater urgency with the emergence of legal tools potentially capable of compelling restoration of nearly every urban, suburban, and exurban stream. Is rehabilitation of urban watersheds really worth the costs? Even if it is, at least in the aggregate, should some watersheds enjoy higher priority than others? And, even if prioritization would be good policy, is it legal, and if not, how can legal reforms allow triage without creating a slippery slope toward complete inaction? These are all thorny questions, and this section begins addressing the answers.

A. The Case for Prioritization

In recent years, a variety of commentators, including some who are strongly committed to water quality improvement, have argued against comprehensive and complete restoration of urban watersheds. For example, the Center for Watershed Protection has urged abandoning full restoration as a goal for urban watersheds, and the

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[315] *See* BIRCH STREAM TMDL, *supra* note 178, at 8.

[316] Kenduskeag Stream, into which Birch Stream discharges, is an important community resource. *See* City of Bangor, Recreation, *at* http://www.bangormaine.gov/vb_recreation.php (last visited February 10, 2010).

[317] Telephone Interview with John Murphy, City of Bangor (January 5, 2010).

[318] BIRCH STREAM TMDL, *supra* note 178.

[319] Murphy and Warren Interview, *supra* note 237.

organization's founder has argued that water quality expectations should be inversely proportional to the degree of watershed urbanization.[320] A recent National Research Council study of urban stormwater management echoed that suggestion.[321] Somewhat similarly, several previous reports by the NRC and others have argued that water quality restoration efforts should be combined with continuous reassessment of restoration goals;[322] EPA has recently encouraged "use attainability analyses," which assess the feasibility of actually attaining water quality standards; and academic studies of watershed restoration have argued for better "triage."[323] These recommendations all reflect a widely shared perception that current water quality goals are often unrealistic and counterproductive and therefore ought to be widely changed.[324]

There are multiple justifications for this view. First, complete restoration of every urbanized watershed is almost certainly impossible. Even with the best treatment systems, an urban landscape probably cannot function like an undeveloped forest.[325] Even achieving more modest restoration goals is much more costly than preventing degradation in a relatively healthy watershed, for retrofitting development usually costs more than building in a particular way in the first instance.[326] Many urban stream specialists therefore think that the best ratios of environmental gain to financial cost

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[320] CENTER FOR WATERSHED PROTECTION, *supra* note 15, at 21; Thomas R. Schueler, *The Impervious Cover Model: Stream Classification, Urban Subwatershed Management and Permitting* 8, 11-16 *at* www.cwp.org/Our_Work/Training/.../icm_and_watershed_mgmt.pdf.

[321] NRC, *supra* note 15, at 546-47.

[322] *See* NRC, *supra* note 15, at 5-6, 90-93; SHABMAN ET AL., *supra* note 125, at 6-7, 25 (arguing that evaluation of water quality goals should sometimes be implemented into the TMDL process).

[323] Bernhardt and Palmer, *supra* note 35, at 746-47; *see* EPA, Basic Information: Introduction to Use Attainability Analyses, *at* http://www.epa.gov/waterscience/standards/uses/uaa/info.htm (last visited January 19, 2010); EPA, *supra* note 211, at 5 ("A watershed permitting analytical approach also considers watershed goals during the permitting process.").

[324] *See* William F. Swetnik, *Urban Aquatic Life Uses—A Regulatory Perspective*, 2001 ENGINEERING FOUNDATION CONFERENCE PROCEEDINGS 163, 163.

[325] *See* Schueler, *supra* note 320, at 16.

[326] Wenger et al., *supra* note 14, at 1092; *see The Economics of Watershed Protection*, *supra* note 37 (describing ways in which stormwater management practices can enhance property values)

could be realized by focusing on watersheds at or beyond the suburban fringe.[327] In highly urbanized areas, by contrast, the environmental benefits of restoration may fall short—far short, in the view of some observers—of justifying the multi-million dollar costs.[328]

Many commentators also worry that focusing on the most heavily urbanized watersheds could be environmentally counterproductive.[329] Recognizing the links between impervious cover density and water quality, cities and states might preclude additional development within already-urbanized watersheds and impose large lot size requirements or other density controls in less developed areas.[330] Some localities already have tried the latter approach, sometimes voluntarily and sometimes under pressure from fisheries regulators.[331] But if these restrictions just spread development, the aggregate effect will be more sprawl, leading to greater aggregate water quality impacts and also to increased habitat loss, road construction, vehicle miles traveled, and air pollution emissions—among other problems.[332] Similarly, even if local governments impose no zoning constraints, the economic cost of urban stream restoration requirements might

[327] *See* Bohlen Interview, *supra* note 294; Interview with Zachary Henderson, Woodard & Curran, in Portland, Maine (June 29, 2009).

[328] *See, e.g.,* Bruce Ramsey, *The instructional tale of the million-dollar fish*, SEATTLE TIMES, November 21, 2001, at B6 (quoting Seattle-Tacoma airport executive involved in mitigating a runway expansion's impacts on salmon: "Probably per fish, it is the most expensive mitigation project known to mankind.").

[329] CENTER FOR WATERSHED PROTECTION, *supra* note 15, at 22 ("[R]evised water quality standards are urgently needed to support smart growth efforts.").

[330] *See* Schueler, *supra* note 320, at 4-6 (describing some regulatory mechanisms to manage impervious cover).

[331] *See, e.g.,* Durbin, *supra* note 166; Greenwood v. Mayor and Tp. Committee of Tp. of Hopewell, 2008 WL 3462431 (N.J. Super. A.D., 2008) (upholding a large lot size ordinance).

[332] EPA, PROTECTING WATER RESOURCES WITH HIGHER DENSITY DEVELOPMENT (2006); Arnold, *supra* note 58, at 28 (explaining the water quality impacts of sprawling development); *see* ROBERT W. BURCHELL ET AL., COSTS OF SPRAWL – 2000 (2002).

discourage infill development[333] and create a sort of "brownsheds"[334] problem. If it occurs,[335] that outcome would be ironic. Many of the standard mechanisms for protecting less developed watersheds—limiting road length and size, preserving trees, and clustering development to protect open space, for example—could complement efforts to address other adverse consequences of urbanization.[336]

The third primary argument in favor of systemized prioritization is that, as a practical matter, some prioritization is inevitable. Even if laws ostensibly require restoration of every urban stream, local, state, and federal governments will be hard-pressed to find the time, money, and political capital to fulfill those mandates.[337] Many watershed restoration efforts rely on federal grant funding, but there aren't sufficient funds for every stream, and every grant for urban stream restoration is unavailable for other water quality initiatives.[338] Permitting requirements theoretically could transfer much of the financial burden to regulated permittees. But private resources are not infinite, and with tight state and federal budgets the additional resources and personnel necessary to even administer expanded permitting programs will not be readily forthcoming, even if the political will to regulate is. Consequently, state and local governments will pick their spots, no matter what the law ostensibly requires. Environmental groups theoretically could spur pervasive regulation through litigation, but

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[333] *See, e.g.,* CENTER FOR WATERSHED PROTECTION, *supra* note 15, at 22 ("added costs can quickly become a barrier to desired redevelopment").

[334] *See generally* Joel B. Eisen, *"Brownfields of Dreams"?: Challenges and Limitations of Voluntary Cleanup Programs and Incentives*, 1996 U. ILL. L. REV. 883, 890-913.

[335] It might not, for the location value of urban sites still could dwarf restoration costs.

[336] *See* Hye Yeong Kwon, *An Introduction to Better Site Design*, in THE PRACTICE OF WATERSHED PROTECTION, *supra* note 37, at 623-632 (describing watershed protection techniques, many with obvious benefits for habitat preservation or air quality protection).

[337] *See* Witherill Interview, *supra* note 25 (stating that Maine DEP lacks the resources to repeat the Long Creek process for all of its impaired urban streams).

[338] The Long Creek process, for example, used section 319 grants and stimulus funding, and stimulus funding also supported Bangor's efforts to restore Birch Stream. Cloutier Interview, *supra* note 3; Murphy and Warren Interview, *supra* note 237.

that too is unlikely; such groups generally can afford to address only a subset of their priorities.[339] Indeed, given their limited resources, both government agencies and environmental groups might well be inclined to focus on the most degraded watersheds.[340] Despite all the theoretical advantages of preventive work, sometimes only a present crisis can motivate a response—or provide a sufficiently clear basis for a legal action.[341] Consequently, if some prioritization inevitably will occur, perhaps it ought to occur systematically rather than through the uncoordinated, opportunistic, and largely reactive decisions of dozens of underfunded and overstretched entities.

B. The Case Against Prioritization

While a triage approach may be practically unavoidable, it will create its own problems. The issues are partly legal: despite the arguments in its favor, triaging does not fit well with the existing regulatory scheme. That regulatory structure could change, but there are also powerful practical arguments against a more flexible approach.

1. Legal Constraints

Much of the literature on urban watersheds suggests that EPA and the states could readily start adjusting water quality standards for urban streams.[342] And the Clean Water Act does seem to provide several mechanisms. Setting water quality standards is a state responsibility, though EPA holds approval authority, and states do establish more

[339] *See* Thompson, *supra* note 176, at 204 ("Both cost and resource considerations significantly limit the number of citizen suits.").

[340] *See generally* Bernhardt and Palmer, *supra* note 35, at 742 (describing disproportionate allocation of financial resources to urban waterways).

[341] A perceived crisis may be necessary for judges to be willing to intervene, given normal judicial deference to agency decisions.

[342] *See, e.g.,* CENTER FOR WATERSHED PROTECTION, *supra* note 15, at 21 ("states have authority to create more achievable standards for non-supporting streams"); Swetnik, *supra* note 324 (describing mechanisms).

protective standards for some waterways than for others.[343] States also must update their water quality standards every three years, and that process theoretically should allow for continuing adjustment.[344] States may downgrade water quality standards if they can demonstrate, through use attainability analyses, that current standards cannot be fulfilled.[345] Finally, even where standards themselves cannot be revised, states are obligated to create "priority ranking(s)" for impaired water bodies.[346] In combination, these provisions suggest substantial flexibility.

In practice, however, standards typically are ambitious and difficult to change. The Clean Water Act's initial deadlines for setting standards were quite short, and many states, lacking time to perform comprehensive studies (or, perhaps, willingness to admit to modest goals), elected to base all of their standards on the act's "interim" goal of making waters fishable and swimmable.[347] Consequently, many states' standards initially demanded fairly pristine water quality across the map, even, perhaps ironically, in urban areas where people would readily accept substantial alteration of terrestrial ecosystems.[348] These ambitious goals were not happenstance; spurring major improvements in water quality was the whole point of the Clean Water Act.[349] And most

[343] 33 U.S.C. § 1313(a), (c) (2006). The standards must include "designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses." *Id.* § 1313(c)(2)(A); *see* 40 C.F.R. § 130.10; Pedersen, *supra* note 131, at 92-94.

[344] 33 U.S.C. § 1313(c)(1) (2006).

[345] 40 C.F.R. § 130.10(g).

[346] 33 U.S.C. § 1313(d)(1)(A) (2006).

[347] *See id.* § 1313(a)(3) (setting deadlines); SHABMAN ET AL., *supra* note 125, at 20 ("Most states began by adopting the CWA goals of fishable and swimmable uses to be attained statewide"); Paul L. Freedman et al., *Factors for Success in Developing Use Attainability Analyses*, 2 WATER PRACTICE 1, 3 (2008).

[348] *See, e.g.,* GENERAL ACCOUNTING OFFICE, WATER QUALITY: INCONSISTENT STATE APPROACHES COMPLICATE NATION'S EFFORTS TO IDENTIFY ITS MOST POLLUTED WATERS 7 (2002) (describing Virginia's designation of all state waters—even those too shallow to swim—as swimmable).

[349] *See* 33 U.S.C. § 1251(1), (2) (2006).

states do have tiered expectations, not uniform, blanket standards.[350] But, as years of subsequent research has revealed, even the lower-tier standards may not be consistent with the hydrologic realities of traditional urban development,[351] and the challenges have only grown as urbanization has expanded across the American landscape.[352]

While the tension between ambitious water quality standards and urbanization patterns has become increasingly clear, revising those standards to accommodate urban development is not easy. In accordance with federal non-degradation requirements,[353] states may lower water quality standards only if a use attainability analysis demonstrates that current uses cannot be attained.[354] For several reasons, such demonstrations are difficult to make. First, EPA does not allow states to abandon a designated use that is also an "existing use."[355] That might not seem constraining, for the core problem in many urban areas is that streams currently fail to support their designated uses, but EPA defines an existing use as any use that existed at any time after November 28, 1975.[356] Consequently, for many areas that urbanized after 1975—which includes much of suburban America—a downgrade isn't legally possible. Second, while EPA's regulations allow use attainability analyses to consider the social and economic costs of restoration,

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[350] *See, e.g.,* MAINE REV. STAT. ANN. tit. 38 § 465 (2001 & Supp. 2009) (setting standards). Even the lowest classification requires "receiving waters… of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community." *Id.* § 465(4).

[351] *See supra* Part II.A.

[352] *See* U.S. DEPT. OF HOUSING AND URBAN DEVELOPMENT, THE STATE OF THE CITIES 2000 x (2000) ("land is being consumed at twice the rate of population growth"); ANDRES DUANY ET AL., SUBURBAN NATION: THE RISE OF SPRAWL AND THE DECLINE OF THE AMERICAN DREAM 7-12 (chronicling shifting development patterns and their consequences).

[353] *See* 40 C.F.R. § 130.12; Florida Public Interest Research Group Citizen Lobby, Inc. v. E.P.A., 386 F.3d 1070, 1073-74 (11th Cir. 2004).

[354] 40 C.F.R. § 130.10(g).

[355] 40 C.F.R. § 130.10(g), (h)(1).

[356] Memorandum from Kenneth M. Mackenthum, Dir., Criteria & Standards Div., to James A. Rogers, Assoc. Gen. Counsel, Water Quality Division (May 23, 1978); Freedman et al., *supra* note 347, at 1-3.

those costs cannot be the justification for a downgrade if technology-based controls on point sources, including sources designated under residual designation authority, could still lead to attainment.[357] Third, EPA generally adheres to a presumption of attainability, and the burden of proof thus lies on the party arguing that a use cannot be attained.[358] Finally, despite EPA's recent promotion of use attainability analyses, guidelines for preparing those analyses still are sparse.[359] Successful use attainability analyses therefore remain rare, particularly for streams in urbanizing areas.[360]

States still do often try to adjust their goals for impaired water bodies. They have attempted to delay promulgation of standards until use attainability analyses could be completed,[361] to "interpret" water quality standards in ways that effectively revise them,[362] or to submit water quality standards that fall short of statutory requirements.[363] Through sparse monitoring or creative definition of water quality standards, states also can avoid even identifying water quality problems.[364] And, as Houck and others have thoroughly documented, states' efforts to respond to the water quality violations they do detect have been uneven at best, at least outside of the traditional NPDES permitting

[357] 40 C.F.R. § 130.10(g)(6), (h)(2).

[358] *See* Kansas Natural Resource Council v. Whitman, 255 F.Supp.2d 1208, 1213 (D. Kan. 2003) (explaining the reasons for this presumption); *Idaho Mining Association v. Browner*, 90 F.Supp.2d 1078, 1088-91 (D. Idaho 2000) (upholding reliance on this presumption). Pervasive uncertainty about the possible extent of restoration makes this presumption rather important.

[359] Brooks Meredith Smith and Andrea West Wortzel, *Environmental Law*, 42 U. RICH. L. REV. 383, 388-89 (2007) ("These rules… are rarely used, in part due to questions about process.").

[360] Smith and Wortzel, *supra* note 359, at 388-89; Freedman et al., *supra* note 347, at 1-2,

[361] *See, e.g.,* Kansas Natural Resource Council v. Whitman, 255 F.Supp.2d 1208, 1213 (D. Kan. 2003) (rejecting EPA's acquiescence to this approach).

[362] *See, e.g.,* Florida Public Interest Research Group Citizen Lobby, Inc. v. E.P.A., 386 F.3d 1070 (11th Cir. 2004).

[363] *E.g. Kansas Natural Resource Council*, 255 F. Supp. 2d at 1210 (describing EPA's rejection of some of Kansas' standards); Northwest Environmental Advocates v. U.S. E.P.A., 268 F.Supp.2d 1255 (D. Or., 2003) (rejecting EPA's approval of some of Oregon's standards).

[364] For general discussion of the variety of monitoring and standard-setting approaches, see GENERAL ACCOUNTING OFFICE, *supra note* 348.

program.[365] EPA has sometimes intervened to address those practices,[366] but not always, and often only when compelled by court order.[367] In short, legal limits on flexibility do not mean the practical absence of flexibility, and even with the emergence of a powerful legal lever like residual designation authority, rigidly consistent adherence to strict water quality standards is unlikely.[368] Nevertheless, with legal paths to downgrades difficult to follow, if not blocked, and illegal paths potentially precluded by EPA oversight or judicial enforcement, a major shift in water quality standards for urban streams seems possible only through widespread and uncorrected disregard for existing law.

2. Information and Incentives

While existing law may limit revisions to urban water quality standards, that alone is not a sufficient reason to reject the possibility of such revisions. Laws can change. And in this context, where many of the key legal requirements come from administrative regulations and interpretive documents, legal change could occur more readily than if major statutory revisions were necessary.[369] But there are reasons why the inflexibility of current law may be quite valuable.

Understanding the potential value of inflexibility requires considering the perils a more flexible, triage-based approach would create. To work well, triage requires

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[365] HOUCK, *supra* note 24 (describing the history of the TMDL program).

[366] *See, e.g.,* PL Energy Maine Hydro LLC v. Department of Environmental Protection, 926 A.2d 1197 (Me. 2007) (discussing EPA's rejection of an attempted downgrade).

[367] *See, e.g.,* Miccosukee Tribe of Indians of Florida v. US, 2008 WL 2967654, *1-*2 (S.D. Fla. 2008) (accusing EPA of turning a "blind eye" to Florida's efforts to circumvent the normal process for amending water quality standards); *Defenders of Wildlife v. Browner*, 909 F.Supp, 1342, 1346-49 (D. Ariz. 1995) (chronicling a protracted history of state non-performance and federal acquiescence).

[368] *See generally* Daniel A. Farber, *Taking Slippage Seriously: Noncompliance and Creative Compliance in Environmental Law*, 23 HARV. ENVTL. L. REV. 297, 298-99 (1999).

[369] *See* National Cable & Telecommunications Ass'n v. Brand X Internet Services, 545 U.S. 967, 981-82 (2005) (explaining that policy changes are a normal part of administrative governance). The new interpretation must be adequately explained and reasonably consistent with the statute, but the broad statutory language upon which EPA's anti-degradation requirements are based should permit some adjustment, so long as the new approaches still promote improvements in water quality. *See* Pedersen, *supra* note 131, at 79 (discussing these provisions).

adequate information, a disinterested decision-maker, a process for making comparative decisions, and an accepted methodology for drawing distinctions. Absent those elements, triage may become haphazard or biased, and a prioritization system may turn into a process for developing watershed-by-watershed excuses for doing nothing. Even worse, with the threat of expensive watershed restoration requirements gone, state and local governments might lose their primary incentive to protect watersheds that are still healthy.[370] Unfortunately, in the context of urban watershed management, all of these necessary elements may often be absent.

The first potential practical problem with a prioritization approach is the likely pervasiveness of information gaps. An informed decision about urban watershed restoration would likely require consideration of the ecosystem services provided by the stream and its surrounding habitat (both within and downstream of the watershed), the values current and future people, both within and outside the adjacent community, would place upon those ecosystem services, the recreational value of the stream, and the economic and political feasibility of protecting or restoring the watershed. Ideally, managers also would be able to assign some weight to the importance of an ethical commitment to environmental integrity, however such integrity might be defined.[371] And they might also want to consider the economic incentives and political signals that watershed protection or restoration would create. Would a robust and expensive restoration mandate push development to other locales or, perhaps, induce other locales to better regulate development? Both reactions seem plausible—and there is some

[370] *See supra* note 237 and accompanying text (describing some of the reactions to the Long Creek process).

[371] *See generally* Aldo Leopold, *The Land Ethic*, in A SAND COUNTY ALMANAC 237-64 (Oxford Univ. Press ed. 1964).

evidence that Long Creek already is spurring the latter reaction[372]—and the relative likelihood of the two reactions has major implications for policy choices.

Unfortunately, for many streams, much of this information is unavailable. Managers may have little idea what an urban watershed means to the surrounding community, and people in the community may not understand the recreational benefits or ecosystem services the watershed provides—or could provide if somehow restored.[373] Engineers and watershed scientists may generally understand that restoration of highly urbanized watersheds costs more than protection of sparsely settled areas, but budgeting urban stream restoration projects remains difficult, particularly with substantial remaining uncertainties about the effectiveness of treatment methods.[374] Likewise, economists know that watershed health can bring economic value,[375] but research on the economic significance of healthy urban streams is minimal.[376] One could finesse these information gaps by using a crude triaging approach that targets protection efforts to the least urbanized areas, where environmental recovery is likely to come at the lowest financial

[372] *See* Witherill Interview, *supra* note 25 (describing the Long Creek process as a wakeup call for other areas); Cloutier Interview, *supra* note 3 (stating that, partly in response to the Long Creek process, South Portland had developed improved stormwater regulations for the whole city); Pinard Interview, *supra* note 223 (describing other initiatives); *see also* Hinchman Interview, *supra* note 203 (describing CLF"s efforts to draw upon the Long Creek process in work with other communities).

[373] *See* Wenger et al., *supra* note 14, at 1085 (identifying as a key research question: "How do structure and function in urban streams combine to produce ecosystem goods and services, and how do those services map to those desired by the public and decision makers?"); Walsh et al., *supra* note 46, at 716 ("Sometimes, value placed in such altered, unnatural environments can be a product of people not missing what they never had.").

[374] *See* Wenger et al., *supra* note 14, at 1085 (identifying questions about the feasibility and cost of restoration); Bohlen interview, *supra* note 294 (acknowledging uncertainty about the effectiveness of the Long Creek cleanup).

[375] *See, e.g.,* Lynne Y. Lewis et al., *Dams, Dam Removal and River Restoration: A Hedonic Property Value Analysis*, 26 CONTEMP. ECON. POL'Y 175 (2008).

[376] I have found just one forthcoming article, which focuses primarily on the value of recreational spaces adjacent to streams in Seoul, Korea. *See* Hyunhoe Bae, *Valuing the Urban Stream Attributes Using Conjoint Analysis Method*, URBAN FORESTRY AND URBAN GREENING (forthcoming).

cost.[377] But that approach involves its own potential paradox: urban areas are usually accessible to more people, and there is obvious logic and, potentially, environmental justice behind restoring natural environments in the places where large numbers of people actually live, work, and recreate.[378] To be done well, then, triage may require more information than most watershed managers have available.

For a variety of reasons, unbiased decisionmakers also may be the exception rather than the norm. Public choice theory provides a partial explanation; stream restoration often serves diffuse interests while creating more focused costs, and one might reasonably expect those who bear the costs to wield disproportionate influence in the triaging process.[379] That disproportionate influence is particularly probable if, as is often the case, most people are unaware of the ecosystem services that a stream provides, while those bearing the impacts are especially accustomed to engaging regulatory processes. In many state and local government offices, developers, large companies, and other major landowners are a familiar presence.[380] To the extent that urban watershed impairment creates problems for downstream receiving waters, a collective action problem impedes restoration; a community will likely realize all of the costs of limiting the downstream migration of pollution, but the benefits may be harder to discern unless

[377] *See* NRC, *supra* note 15, at 546-47 (suggesting this approach). Of course, lightly developed watersheds still may be degraded by agricultural use.

[378] *See* Lord et al., *supra* note 39; *see also* CENTER FOR WATERSHED PROTECTION, *supra* note 15, at 21-22 (noting that political support for watershed restoration is often strongest in "moderately to heavily developed watersheds"). There may also be more money for restoration in highly urbanized areas because more landowners could be subject to permitting requirements.

[379] *See* MANCUR OLSON, JR., THE LOGIC OF COLLECTIVE ACTION: PUBLIC GOODS AND THE THEORY OF GROUPS (1965).

[380] *See* William W. Buzbee, *Urban Sprawl, Federalism, and the Problem of Institutional Complexity*, 68 FORDHAM L. REV. 57, 89-90 (1999) (discussing a similar dynamic in the context of transportation planning).

other communities pursue similar restoration projects.[381] Finally, psychological tendencies like the endowment effect and the normal human tendency toward hyperbolic discounting may distort valuation of restored streams.[382] It's easy to undervalue a healthy urban stream if you've never seen such a thing, and don't expect that you will see it until a five- or ten-year restoration process is complete.[383] All of these tendencies may help explain why states and local governments have often been so reluctant to engage in urban watershed protection—and why Congress and the EPA have traditionally favored legal approaches that deny much of the flexibility that systematic triaging would require. Counterbalancing such disproportionate interests and tendencies toward inertia may require clear, simple, and facially inflexible rules.[384]

Finally, existing law creates few opportunities for comparative decision-making. In multiple ways, the Clean Water Act encourages independent decision-making processes for each watershed. Each impaired waterway gets its own TMDL.[385] EPA's use attainability analysis regulations anticipate a watershed-by-watershed approach.[386] Watershed-based permitting, as envisioned by EPA, provides a mechanism for allocating effort within a watershed, not between watersheds.[387] EPA must make some comparative judgments when allocating grant funding, and comparative judgments about different subwatersheds are unavoidable if regulators are focusing on a large watershed with

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[381] *See* Arnold, *supra* note 16, at 292.

[382] *See* Barton H. Thompson, *Tragically Difficult: The Obstacles to Governing the Commons*, 30 ENVTL. L. 241, 256-65 (2000) (describing psychological tendencies that pose challenges for environmental management).

[383] *See* Walsh et al., *supra* note 46, at 716; *but see* Witherill Interview, *supra* note 25 (noting that memories of fishing and swimming in the Long Creek watershed influenced the process).

[384] *See* Oliver A. Houck, *On the Law of Biodiversity and Ecosystem Management*, 81 MINN. L. REV. 869, 883-84 (1997) ("Tough odds call for precise law.").

[385] 33 U.S.C. § 1313(d) (2006).

[386] *See* 40 C.F.R. § 130.10(g).

[387] *See* EPA, *supra* note 243.

multiple tributaries. But existing law otherwise does not create processes for weighing the value of restoration efforts in watershed A against efforts in watersheds B and C, let alone provide a mechanism for downgrading expectations in watershed A if work in watersheds B and C would provide greater value. Absent a mechanism for making such comparative choices, prioritization could easily occur through a series of poorly informed, ad hoc decisions.

C. Finding Balance

The emerging legal mechanisms for stronger protection of urban watersheds create a quandary. Mandating intensive restoration of every impaired watershed in the country, as now seems legally possible, is unrealistically ambitious; the aggregate financial costs of restoring literally thousands of watersheds would be astronomical and the environmental side-effects might be serious. But there are reasons to be skeptical about giving state or local governments broad discretion to pick their spots. Indeed, in practice, state and local governments typically have held such discretion, and the common result has been inattention to urban water quality, even when some pro-active attention might have produced great environmental benefit at little or no cost.

The key question, then, is whether there is some way to introduce greater flexibility into the legal system without losing the positive incentives that stringent mandates create. My tentative answer—a hypothesis, at this stage—is that such a mechanism can be developed. While its creation would likely require new rules and guidance, the changes need not be drastic, and the overlying statutory structure could remain intact. The mechanism would involve a basic premise: EPA would allow a state to downgrade water quality standards for small watersheds in core urban areas if the state

could show (1) that current uses[388] of the urban watersheds would not be impaired; (2) that the downgrades would not contribute individually or cumulatively to violations of water quality standards in larger receiving waters;[389] (3) that the social cost of fully restoring the urban watershed would outweigh the social value; (4) that affected communities had ample opportunity to participate in the downgrade decisions; and (5) that the downgrades are balanced by an overall program to address landscape-based impacts on water quality across the state. That program could not consist only of vague assurances or hortatory commitments. Instead, the state would need to demonstrate the existence of meaningful incentives and enforceable regulatory controls sufficient to ensure low-impact development patterns, both on a site-specific and a watershed scale; the existence of a monitoring program robust enough to verify the effectiveness of the regulatory program; and the presence of enforceable contingency measures or other penalties should the monitoring program detect water quality deterioration. The state would need to show, in other words, that it was genuinely triaging—that selected urban watersheds were held to a lower standard because treatment elsewhere would do greater good and, importantly, would actually occur.

Fleshing out this proposal and assessing its viability will require additional research.[390] The key overarching question is whether restoration efforts in some watersheds are in fact more valuable than efforts in others. If not, triaging is not nearly as essential as the literature currently suggests. To answer that question, in turn, requires better understanding of the social and environmental values provided by different

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[388] By current uses, I mean present uses. *But see* Mackenthum Memorandum, *supra* note 356.

[389] I suggest this constraint because of the collective action problems discussed above, *see supra* note 381 and accompanying text, and because almost all communities value their larger waterways.

[390] I am currently involved in an ongoing interdisciplinary research project that will include evaluation of this hypothesis.

watersheds; managers and researchers still do not know enough about the ways in which communities value small watersheds.[391] Similarly, while watershed scientists and engineers know that exurban and rural watersheds cost less to protect, no accepted methodology exists for weighing those cost savings against the value of restoring watersheds in densely populated areas where, presumably, restoration will benefit more people. It seems probable that even within similarly urbanized areas, some watersheds will be easier to restore than others. But because there are few case studies of urban watershed restoration, scientists and engineers cannot readily discern which urban watersheds could more easily be restored, and what degree of restoration one might reasonably expect.[392] Finally, few studies have rigorously evaluated the economic and regulatory incentives created by a legal mandate for urban watershed restoration.[393] If that mandate primarily deters infill development, triaging is crucially important. But if a few expensive cleanups inspire governments or developers elsewhere to prevent degradation, inflexibility may be well worth its costs.

The nature of these questions also has implications for the future of urban watershed research. None of these questions is purely legal or ecological; indeed, none fits neatly within the bounds of any particular discipline. The degradation of urban streams instead creates an unavoidably interdisciplinary problem, one that demands expertise not just from physical scientists but also from social scientists, engineers, economists, and lawyers. With the combination of a developing scientific consensus on the effects of impervious cover and emerging legal levers capable of translating that consensus into mandatory obligations, the problem is now urgent.

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[391] *See* Wenger et al., *supra* note 14, at 1085.
[392] *See supra* note 86 and accompanying text.
[393] Because few urban streams have been restored, there aren't many opportunities to collect data.

VI. CONCLUSION

Two hours' drive south of Long Creek, another watershed stands at the cusp of this transformation of the law of urban waterways. The Charles River, unlike Birch Stream or even Long Creek, is not the least bit obscure. It is a short river—only eighty miles in length—and its watershed, at 308 square miles, is not huge.[394] But nearly a million people live in the watershed.[395] They, and the region's many visitors, put the river to heavy use, with approximately 20,000 people recreating on or along the river on an average day.[396] The river also is an important cultural landmark: the start of Paul Revere's ride, the site of one of the world's largest rowing regattas, and the distinguishing feature of the Boston landscape. Without exaggeration, EPA has referred to it as "one of the most culturally and historically significant rivers in the United States."[397]

The Charles is much cleaner than it once was. For over a century, its pollution was legendary, the stuff of pop songs and presidential campaign rhetoric.[398] Years of intensive effort, much of it devoted to the traditional Clean Water Act priorities of controlling industrial discharges and constructing sewage treatment plants, have gone a long way toward improving the river's water quality.[399] But the Charles still falls well

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[394] *See* Massachusetts Executive Office of Energy and Environmental Affairs, Charles River Watershed, *at* http://www.mass.gov/?pageID=eoeeaterminal&L=4&L0=Home&L1=Air%2C+Water+%26+Climate+Change&L2=Preserving+Water+Resources&L3=Massachusetts+Watersheds&sid=Eoeea&b=terminalcontent&f=eea_water_charles&csid=Eoeea (last visited January 30, 2010).

[395] *Id.*

[396] EPA, *supra* note 38, at 3.

[397] *Id.*

[398] *See* The Standells, Love that Dirty Water (Tower/Capitol Records 1966); Editorial, *Clean Politics: Bush Takes the Lead on Environmental Issues*, DALLAS MORNING NEWS, Sept. 2, 1988 (discussing George H.W. Bush's use of the "super-polluted" Charles River to attack Michael Dukakis' environmental credentials).

[399] *See* Charles River Watershed Association, Charles River History, *at* http://www.crwa.org/cr_history.html (last visited January 30, 2010).

short of attaining water quality standards,[400] and, just as in Long Creek and in many other urban watersheds, a key cause is the impervious cover associated with urbanization of the watershed. In 2008, EPA invoked residual designation authority and declared its intent to require permits for all landowners with an acre or more of impervious cover.[401] EPA started small; the initial declaration applies only to four towns in the upper watershed.[402] But there is no legal or scientific reason why the designation could not be expanded to cover the entire watershed.[403]

This nascent regulatory initiative highlights the potential reach of the legal developments described in this article. Though pioneered in small, little-known watersheds, the new approaches are grounded in laws that could apply across the urbanized landscape; the development patterns of the Charles River watershed are similar to those across much of America. The Charles River efforts also illustrate the gravity of the shift. While restoring Long Creek will be no small feat, the restoration of a nearly million-person watershed will be an extraordinary task. But the Charles River restoration efforts also illustrate the potential benefits, and the costs of continued indifference to the water quality impacts of development. Ignorance of those impacts contributed to chronic water quality violations, many of which might have been cheaply ameliorated through some proactive planning, in one of the nation's most important urban waterways. Addressing them, both in the Charles and in many other watersheds, still could accelerate

[400] EPA, *supra* note 38, at 9-10 ("the Lower Charles River often violates water quality standards for the designated recreational and aquatic life uses").

[401] *Id.*

[402] *Id.* at 1.

[403] An expanded designation may still occur. *See* Telephone Interview with William Walsh-Rogalski, EPA Region 1 (June 29, 2009) (noting that CLF had threatened to petition for residual designation of the entire Charles River watershed and the adjacent Neponset and Mystic River watersheds).

the already-ongoing rediscovery of urban watersheds, and, more generally, of the value of healthy urban environments.[404]

This Article has argued that the emerging framework for addressing those impacts should be reformed in several ways. But even with their flaws, the emergent approaches can start redressing environmental problems that have long seemed intractable, and can provide an impetus and a starting point for developing an improved legal regime.

[404] *See generally* Lord et al., *supra* note 39.