DRIVING LOCAL GOVERNMENTS TO WATERSHED GOVERNANCE

BY

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Recent trends in watershed governance are attributable to two developments in watershed protection. First, the growth of ecosystem services research has reframed the manner in which value accrues in natural resources. At the intersection of economics and ecology, the study of ecosystem services has supported the attribution of economic value to ecosystem processes. In the meantime, ecosystem services research has freed local governments to conceive of value in natural resources in ways that match community preferences and priorities. Second, local governments are participating quite intentionally in watershed management by identifying with particular watersheds, particular watershed features, and particular watershed functions, in ways that other entities lack the institutional capacity to do. These developments are important for watershed protection in ways not previously seen: even if political boundaries are left intact, when local governments protect watershed functionality, they are acting to preserve natural capital, and natural capital is geographically situated in ways that defy the sanctity of political boundaries. Part II of this Article discusses the complexity of functional watersheds and identifies watershed features that can be categorized in ecosystem services terms as the provisioning, regulating, cultural, and supporting services. By discussing watershed services, this part identifies the valuable ecosystem services in watersheds and the objectives of watershed investments. This Part explores the notion that local governments are so grounded relative to watersheds that the task of identifying and satisfying local needs and parochial perspectives—often thought to impede sound environmental planning—should be considered a primary driver in a collaborative and developing process. Part III of this Article discusses the manner in which the ecosystem

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services perspective illuminates particular local governance needs by focusing on the nested benefits of ecosystem services information.

I. INTRODUCTION

More than a century has passed since John Wesley Powell demanded a linkage between governance and watersheds:

> I want to present to you what I believe to be ultimately the political system which you have got to adopt in this country, and which the United States will be compelled sooner or later ultimately to recognize. I think each drainage basin in the arid land must ultimately become the practical unit of organization, and it would be wise if you could immediately adopt a county system which would be convenient with drainage basins.[1]

Although Powell would not have used terms like ecosystem processes or ecosystem services, his plea nonetheless is underlain by the notion that establishing watersheds as units of governance would thereby align the premises and consequences of land-use decision making and water resource management. In any event, Powell's request has gone largely unnoticed and

[1] Testimony of John Wesley Powell to the Montana Constitutional Convention in 1889, *quoted in* DANIEL KEMMIS, THIS SOVEREIGN LAND: A NEW VISION FOR GOVERNING THE WEST 177 (2001). Closely related is the humorous but insightful appeal to the need to assign a "watershed address":

> Children learn about their place in the world—their street address, city, and zip code at a very early age. But there is another important dimension to our lives that is also important to our sense of place—our watershed or ecological address. The future of the planet and the protection of the nation's water resources depend on a universal understanding and appreciation of watersheds.

BENJAMIN H. GRUMBLES, U.S. ENVTL. PROT. AGENCY, BUILDING LIVABLE COMMUNITIES STARTS WITH A WATERSHED ADDRESS (2007), *available at* http://www.epa.gov/owow/watershed/oped2007.pdf.

unanswered.[2] More than a century of municipal growth since Powell's statement has focused on maximizing jurisdictional control within *political*—rather than *natural*—boundaries, while natural resource management and allocation have focused on identifying the usable resources that remain and how to exploit them.[3] Even the most recent sophisticated environmental laws undermine watershed health and function through regulatory fragmentation of watersheds.[4]

More recently, two emerging developments have begun to converge and forge new connections that bring resource management closer to Powell's vision. First, the growth of ecosystem services research has reframed our understanding of how economic values accrue in natural resources.[5] At the intersection of economics and ecology, the study of ecosystem services supports the recognition and attribution of economic value to ecosystem processes that provide goods and services on which human life and the economy depend. The ecosystem services approach recognizes that "[h]uman society has never had a more pressing need to understand its

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[2] The appeal has been repeated many times, although as this Article suggests, more recent demands for watershed-scale governance may have a different flavor. *See, e.g.*, Craig Anthony (Tony) Arnold, *Adaptive Watershed Planning and Climate Change*, 5 ENVTL. & ENERGY L. & POL'Y J. 417, 420 (2010) ("[W]ater resources should be managed at ecosystem scales, or at watershed scales, as watersheds are the ecological systems of water."); A. Dan Tarlock, *The Potential Role of Local Governments in Watershed Management*, 20 PACE ENVTL. L. REV. 149, 153 (2002) (describing the watershed as "the 'right' organizing unit for integrated land and water resource management").

[3] *See generally* John G. Sprankling, *The Antiwilderness Bias in American Property Law*, 63 U. CHI. L. REV. 519 (1996) (providing a critical review of wilderness regulation).

[4] The Environmental Protection Agency has summarized the need for a transition to a watershed perspective:

> Traditionally, water quality improvements have focused on specific sources of pollution, such as sewage discharges, or specific water resources, such as a river segment or wetland. While this approach may be successful in addressing specific problems, it often fails to address the more subtle and chronic problems that contribute to a watershed's decline. For example, pollution from a sewage treatment plant might be reduced significantly after a new technology is installed, and yet the local river may still suffer if other factors in the watershed, such as habitat destruction or polluted runoff, go unaddressed.

OFFICE OF WETLANDS, OCEANS, & WATERSHEDS, U.S. ENVTL. PROT. AGENCY, EPA800-F-96-001, WHY WATERSHEDS? (1996), http://water.epa.gov/type/watersheds/why.cfm (last visited Feb 18, 2012).

[5] *See* J.B. Ruhl et al., *Proposal for a Model State Watershed Management Act*, 33 ENVTL. L. 929, 931 (2003) (noting that the idea of watershed management is not new, but that the current trends illustrate a more comprehensive approach); James Salzman et al., *Protecting Ecosystem Services: Science, Economics, and Law*, 20 STAN. ENVTL. L.J. 309, 310–11 (2001) (discussing the extraordinarily high costs to replace ecosystem services); *see also* Robert Costanza et al., *The Value of the World's Ecosystem Services and Natural Capital*, 387 NATURE 253, 253 (1997); Gretchen C. Daily et al., *Ecosystem Services: Benefits Supplied to Human Societies by Natural Ecosystems*, ISSUES IN ECOLOGY, Spring 1997, at 2, 2, *available at* http://www.esa.org/science_resources/issues/FileEnglish/issue2.pdf; Geoffrey Heal et al., *Protecting Natural Capital Through Ecosystem Service Districts*, 20 STAN. ENVTL. L.J. 333, 334 (2001).

dependence on nature"[6] and requires an accounting of ecosystem services with an eye on the value of maintaining the conditions under which ecosystems can continue to function.[7] An awareness of ecosystem service values can compel local governments to take ownership, both legally and conceptually, in the processes that support well-being in their communities.

Second, many local governments have begun to participate quite intentionally in watershed management, albeit in some instances due to state or federal requirements.[8] Local attention to watersheds might also be attributable to the circumstance that, at this point, environmental regulations have "picked all the 'low hanging' fruit and must now deal with more difficult diffuse problems that are increasingly less amenable to national solutions."[9] Yet, for a variety of reasons, local governments identify with particular watersheds, particular watershed features, and particular watershed functions in ways that other entities lack either the incentive or institutional capacity to do. These developments are important for watershed protection: even leaving political boundaries intact, when local governments protect watershed functionality, they are acting to preserve natural capital, and natural capital is geographically situated in ways that defy the intractability of political boundaries.

This Article addresses the importance of driving local governments to watershed planning and management by introducing the perspective of ecosystem and watershed services.[10] Part II of this Article identifies the valuable ecosystem services produced by healthy, well functioning watersheds, including provisioning, regulating, cultural, and supporting services, thus identifying the objectives of watershed protection and investments.[11] Part III explores the nature of watershed planning in the

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6 John Peterson Myers & Joshua S. Reichert, *Perspectives on Nature's Services*, *in* NATURE'S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS xvii, at xviii (Gretchen C. Daily ed., 1997).

7 *See, e.g.*, Mary Christina Wood, *Advancing the Sovereign Trust of Government to Safeguard the Environment for Present and Future Generations (Part II): Instilling a Fiduciary Obligation in Governance*, 39 ENVTL. L. 91, 102 (2009) (arguing that a natural capital accounting "is a necessary tool to prevent the government from bankrupting the natural wealth of this country").

8 Many of these developments have been encouraged, driven, or compelled by state and federal direction. *See* OFFICE OF WATER, U.S. ENVTL. PROT. AGENCY, A REVIEW OF STATEWIDE WATERSHED MANAGEMENT APPROACHES: FINAL REPORT 8–9, 11–14 (2002), *available at* http://www.epa.gov/owow/watershed/approaches_fr.pdf; Mark Lubell et al., *Watershed Partnerships and the Emergence of Collective Action Institutions*, 46 AM. J. POL. SCI. 148, 150 (2002) (reporting increased formation of partnerships over the space of four decades).

9 Tarlock, *supra* note 2, at 158.

10 This Article often uses the terms "watershed services" and "ecosystem services" interchangeably. As Tony Arnold notes, "Watersheds are the ecosystems at which surface water processes and functions occur." Arnold, *supra* note 2, at 424; *see also* TERHI MAJANEN ET AL., INNOVATIONS IN MARKET-BASED WATERSHED CONSERVATION IN THE UNITED STATES: PAYMENTS FOR WATERSHED SERVICES FOR AGRICULTURAL AND FOREST LANDOWNERS 8 (2011), *available at* http://ecoagriculture.org/documents/files/doc_362.pdf (noting that payment for watershed services "is a subset of payments for ecosystems services").

11 MILLENNIUM ECOSYSTEM ASSESSMENT, ECOSYSTEMS AND HUMAN WELL-BEING: SYNTHESIS v (2005), *available at* http://www.maweb.org/documents/document.356.aspx.pdf.

context of existing sovereignty, regulatory, and property ownership schemes for the purpose of identifying the degree to which local governments should be held to account for watershed investments. This discussion explores the notion that local governments are so grounded relative to watersheds that the task of identifying and satisfying local needs and parochial perspectives—often thought to impede sound environmental planning—can be considered a primary positive driver toward developing a collaborative process. Part IV of this Article discusses the manner in which the ecosystem services perspective enables local governance of watershed functions in ways that are responsive to local needs and illustrates by example the stakes and drive that local governments put into the protection of local watershed capital.

II. NATURAL CAPITAL IN WATERSHEDS AND THE RELEVANCE OF LOCAL VALUE

It is now well settled that functioning ecosystems provide services that have substantial health and economic benefits.[12] It is also well settled that we have largely squandered ecosystem services in the past through the consumption of ecosystem goods without regard for linkages between these goods and the ability of ecosystems to continue delivering goods and services.[13] As Janet Neuman notes, this approach was bound to cause trouble: "This short-sighted approach is akin to spending down the principal of an endowment instead of limiting spending to the interest income. Pretty soon, there is no more income, and the principal itself is gone."[14] This Part provides an examination of ecosystem services and the insights that an ecosystem services valuation has on local conditions and well-being and suggests that local capacity for watershed governance will be improved by linking ecosystem processes and the ecosystem benefits enjoyed by communities.

The term "ecosystem services" has been defined as "measurable benefits that people receive from ecosystems. Ecosystems produce goods and services as a result of ecosystem process, function, and structure."[15] As noted by the National Research Council: "The value of capital is defined by flows of useful services. Defining ecosystems as natural capital that yields useful services is the first step toward quantifying the value of ecosystems."[16]

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12 *See* Daily et al., *supra* note 5, at 2; Costanza et al., *supra* note 5, at 253.

13 Heal et al., *supra* note 5, at 340–41 (identifying two fundamental reasons for the current threats to ecosystem services: first, that natural ecosystems have been altered by the "scale of the human enterprise" and second, that "natural capital is unrecognized as such by most people"); *see also* Costanza et al., *supra* note 5, at 259.

14 Janet Neuman, *Thinking Inside the Box: Looking for Ecosystem Services Within a Forested Watershed*, 22 J. LAND USE & ENVTL. L. 173, 186 (2007).

15 EARTH ECON., A NEW VIEW OF OUR ECONOMY: NATURE'S VALUE IN THE SNOQUALMIE WATERSHED 15 (2010), *available at* http://www.eartheconomics.org/FileLibrary/file/Reports/Puget%20Sound%20and%20Watersheds/Earth_Economics_Report_on_the_Snoqualmie_Watershed_compressed.pdf.

16 COMM. ON MO. RIVER ECOSYSTEM SCI., NAT'L RESEARCH COUNCIL, THE MISSOURI RIVER ECOSYSTEM: EXPLORING THE PROSPECTS FOR RECOVERY 101 (2002).

Attentiveness to ecosystems reveals the importance of ecosystem services that are not otherwise recognized in the marketplace.[17] Exploring the functions and outcomes of ecosystem processes forces recognition of the manner in which ecosystem goods are produced, as well as vital processes that regulate water flow and climate, air quality, and biodiversity.[18]

The importance of the ecosystem services approach is in the collaboration it requires between ecology and economics to perform functions that alone each would be unable to achieve. For instance, ecology identifies natural processes and functions.[19] What ecology cannot do is explain how to value benefits flowing from ecosystem processes. As such, one of the distinguishing features of the ecosystem services approach is the notion of beneficiaries, a concept that begs both for an identification of actual beneficiaries and the development of some standard of measurement based on demand for services.[20] From this perspective we can more easily see that "[e]cosystems are assets, a form of wealth."[21]

One of the most significant deliverables of the ecosystem services approach is its ability to better capture total economic value (TEV), a goal that has proven elusive in the formulation of environmental policy. Where previous attempts to value nature have generated contentious dialogue on preferences and priorities,[22] ecosystem services valuation enables a grounded accounting of the actual and inevitable costs of allowing landscape transformation from functioning ecosystems to impervious, artificial, and degraded places.[23] Not surprisingly, one of the more prevalent applications of ecosystem services to an understanding of TEV is an inventory of those services that have been lost.[24]

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17 Salzman et al., *supra* note 5, at 312 ("[These] services themselves have no market value for the simple reason that no markets exist in which they can be exchanged.").

18 *See, e.g.*, Ruth Mathews, *Instream Flow Protection and Restoration: Setting a New Compass Point*, 36 ENVTL. L. 1311, 1314 (2006) ("Often invisible, ecosystem services and their value to society are frequently ignored when determining the allocation of water to instream flows. If included, ecosystem services would further underline the importance of dedicating water to instream flows beyond just the minimum flow. Degradation of river, floodplain, and estuarine ecosystems through alteration of the flow regime results in lost opportunities for individuals and society, opportunities inherent in healthy ecosystems. Therefore, ecosystem services must be considered in the determination of instream flows if society is going to have access to the full benefits available from these ecosystems.").

19 *See* EARTH ECON., *supra* note 15, at 54.

20 *See* Kai M. A. Chan et al., *Conservation Planning for Ecosystem Services*, 4 PLoS BIOLOGY 2138, 2138–39 (2006), *available at* http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1629036/ ("The key feature that distinguishes these services from ecosystem functions or processes is the explicit involvement of beneficiaries. As such, a proper characterization of ecosystem-service targets involves consideration of the demand for services—its magnitude and spatial distribution—in addition to the underlying ecosystem processes.").

21 EARTH ECON., *supra* note 15, at 18–21 (arguing for ecological economics, which combines traditional economics with ecology to consider "natural capital," or nature's provision of resources, energy, and ecosystem functions).

22 Salzman et al., *supra* note 5, at 327.

23 EARTH ECON., *supra* note 15, at 16–17.

24 COMM. ON MO. RIVER ECOSYSTEM SCI., *supra* note 16, at 101 ("An example of lost ecosystem services is provided in a quote from the Yankton Dakotian newspaper, dated

Even in the context of valuing lost ecosystem services, it is important to note that the ecosystem services approach does not dictate policy choices; at most, an ecosystem services valuation allows decision makers to more fully appreciate the values of ecosystem functions and components. Accordingly, an ecosystem services valuation must be understood as a tool that facilitates informed choices.[25] An ecosystem services valuation may demonstrate that it is more costly to transform a natural landscape than preserve it; often, it will even prove more cost effective to *restore* ecosystems than to continue operating, maintaining, and replacing built infrastructure. For instance, the National Research Council has considered the value of hydropower production on the Missouri River and concluded that, from an ecosystem services perspective, ecosystem restoration on the Missouri "may be justifiable solely on the grounds that it represents an economic improvement on current mainstem dam operations."[26] Of course, in many of these cases, an ecosystem services value will suggest a difficult course that will, at least at some level, redistribute wealth and entitlements.[27]

Watersheds are defined geographically to include "[t]he entire surface drainage area that contributes water to a lake or river."[28] Recently, the term

Tuesday, August 5, 1862: 'Katphish, of fabulous dimensions, are being taken from the placid waters of the Big Muddy about these times. A great many of them weigh two and three hundred pounds!'").

25 Andrew Wilcox & John Harte, *Ecosystem Services in a Modern Economy: Gunnison County, Colorado*, *in* NATURE'S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS, *supra* note 6, at 311, 325 ("The benefits from mining molybdenum are easier to measure than the ecosystem service benefits that derive from leaving land in its natural state . . . , but striking a balance between economic activity and environmental quality in a manner that maintains well-being of current and future generations depends on an appreciation of these latter benefits.").

26 COMM. ON MO. RIVER ECOSYSTEM SCI., *supra* note 16, at 106 ("There is today widespread recognition that the regulation of large rivers by dams and reservoirs has often resulted in losses of valuable ecological services. Although the environmental impacts of dams often have not been economically justified, many of those impacts can be reversed. On the Missouri River, there is a distinct prospect that a reversal of tradeoffs that would favor ecosystem restoration may be justifiable solely on the grounds that it represents an economic improvement on current mainstem dam operations.").

27 Wei Zhang et al., *Ecosystem Services and Dis-Services to Agriculture*, 64 ECOLOGICAL ECON. 253, 259 (2007) ("But merely stating the economic value of a given service or set of services does not create incentives to maintain it. Policies will typically be required to create markets for currently non-marketed [ecosystem services] or to compensate people whose ecosystem management provides beneficial externalities to others, internalizing [ecosystem services] value into land management decisions.").

28 COMM. ON RESTORATION OF AQUATIC ECOSYSTEMS: SCI., TECH., & PUB. POL'Y, NAT'L RESEARCH COUNCIL, RESTORATION OF AQUATIC ECOSYSTEMS: SCIENCE, TECHNOLOGY, AND PUBLIC POLICY 524 (1992); *see also* Arnold, *supra* note 2, at 424 ("A watershed is an area of land that drains to a common point on a surface body of water, such as a river, stream, or lake."); Brad T. Clark et al., *Environmental Assessment: Watershed Management and Organizational Dynamics: Nationwide Findings and Regional Variation*, 36 ENVTL. MGMT. 297, 297 (2005) ("A watershed represents a topographically defined area that is drained by a stream system—representing a smaller upstream catchment—that is a constituent of a larger river basin. This landscape encompasses *both* surface and groundwater supplies, in addition to related terrestrial and community resources. Increasingly, the watershed has come to be viewed as a place based and ecological entity, as well as a socioeconomic and political unit to be utilized for management planning, conservation strategies, and implementation purposes."); James M. Omernik &

has been understood in multiple perspectives,[29] largely to account for the notion of competition and tradeoffs in watershed services. It is the latter understanding of watershed—one that depends on both geographic and ecosystem functionality—that concerns this Article. Here, the definition of watershed is less precise, but arguably more meaningful.[30] A watershed-level ecosystem services analysis will identify "functional boundaries that have an impact on the migration or dispersal of the organisms being studied."[31] Within the watershed, a functioning ecosystem provides drinking water, habitat, biodiversity, and biomass, sequesters carbon, filters a variety of airborne and water pollutants, and regulates flood events, among other things.[32]

To provide a full and accurate accounting of ecosystem services in watersheds, ecosystem services are characterized according to the type of services provided: provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation,

Robert G. Bailey, *Distinguishing Between Watersheds and Ecoregions*, 33 J. AM. WATER RESOURCES. ASSOC. 935, 937 (1997), *available at* http://www.epa.gov/bioiweb1/pdf/OmernikandBaily1997_DistinguishingBetweenWatershedsandEcoregions.pdf ("[T]here is little disagreement regarding the definition of watersheds. Quite simply, they are topographic areas within which apparent surface water runoff drains to a specific point on a stream or to a waterbody such as a lake.").

[29] *See* Robert W. Adler, *Addressing Barriers to Watershed Protection*, 25 ENVTL. L. 973, 976 (1995) ("Views of the broader concept of 'watershed management,' 'watershed protection,' or 'watershed-based approaches,' however, vary considerably and reflect diverse governmental and interest-group perspectives."); Scott D. Anderson, *Watershed Management and Nonpoint Source Pollution: The Massachusetts Approach*, 26 B.C. ENVTL. AFF. L. REV. 339, 365 (1999) ("This simple definition of watershed becomes more complicated when the term 'management' is attached to discuss comprehensive, multidisciplinary programs in water resource management. The exact meaning of watershed management can change depending on the perspectives and priorities of the individual or group that offers the definition. Watershed management seeks to protect ecological resources and human health, and promote equitable and economically feasible solutions to environmental problems by involving a larger, decentralized group of interested parties, or 'stakeholders' in the decisionmaking process."). John Wesley Powell defined "watershed" to include "that area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of a community." U.S. Envtl. Prot. Agency, *What Is a Watershed?*, http://water.epa.gov/type/watersheds/whatis.cfm (last visited Feb. 18, 2012).

[30] Tarlock, *supra* note 2, at 161–62 (noting there can be no precise definition of watershed); Lubell et al., *supra* note 8, at 150 ("Watersheds provide a natural unit for analyzing partnerships because they define the geographic scope within which water-related resource conflicts take place. Watersheds are defined by the United States Geological [Survey] (USGS), which has created a hierarchical classification of hydrological units that divides regions into major river basins like the Missouri or Mississippi rivers, and then subdivides the regions into successively smaller units. The smallest unit is the hydrological accounting unit (HUC), or watershed; there are 2149 HUCs that fully cover the United States.").

[31] Charles P. Lord et al., *Natural Cities: Urban Ecology and the Restoration of Urban Ecosystems*, 21 VA. ENVTL. L.J. 317, 326 (2003) (explaining the importance of overcoming "the obstacle of arbitrary political boundaries").

[32] *See* EARTH ECON., *supra* note 15, at 15 & tbl.1 (identifying ecosystem services in the watershed).

photosynthesis, and nutrient cycling.[33] Provisioning services in watersheds are the easiest to value in monetary terms because these are the processes that produce goods that we use as food, fuel, building materials, and other consumables.[34] Watersheds provide clean water for drinking and irrigation.[35] Structural elements and processes within watersheds influence the hydrological cycle, affect surface and groundwater flows, and provide flood storage.[36] Watersheds also provide other goods, including fish and wildlife, biomass, agricultural products, medicines, and lumber.[37]

The values of ecosystem services in other categories are not always as easy to estimate in economic terms. Their loss, however, is no less a drain on natural capital. For instance, regulating services include the varieties of "benefits obtained from the regulation of ecosystem processes," including the regulation of air and water quality, erosion, climate, waste treatment, disease, pests, pollination, and natural hazards.[38] Supporting services are considered "necessary for the production of all other ecosystem services. They differ from provisioning, regulating, and cultural services in that their impacts on people are often indirect or occur over a very long time, whereas changes in the other categories have relatively direct and short-term impacts on people."[39] Thus, supporting services also present measurement challenges. Examples of supporting services include soil formation, photosynthesis, primary production, nutrient cycling, and water cycling.[40] Cultural services are "nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences."[41] Examples of cultural services include cultural diversity, spiritual and religious values, knowledge systems and educational values, inspiration, aesthetic values, social relations, sense of place, cultural heritage values, and recreation.[42]

III. LOCAL GOVERNMENT AS A PLACE FOR PRIORITIZATION AND THE IMPORTANCE OF LOCAL WATERSHED GOVERNANCE

The value of functioning ecosystems has long been misunderstood. In part, we have failed to understand the linkage between our basic needs and the services provided by the environment,[43] resulting in our failure to

33 MILLENNIUM ECOSYSTEM ASSESSMENT, *supra* note 11, at 7 tbl.1.

34 *See* Stephen Farber et al., *Linking Ecology and Economics for Ecosystem Management*, 56 BIOSCIENCE 121, 123 tbl.1, 124 (2006).

35 *Id.* at 123 tbl.1, 130 tbl.4.

36 *Id.* at 123 tbl.1.

37 *See* EARTH ECON., *supra* note 15, at 15 & tbl.1.

38 MILLENNIUM ECOSYSTEM ASSESSMENT, *supra* note 11, at 40.

39 *Id.*

40 *Id.*

41 *Id.*

42 *Id.*

43 *See* Wood, *supra* note 7, at 118 ("While Americans understand the important role of human-made infrastructure such as electricity, roads, water conveyance systems, communication lines and the like, many are oblivious to the even more vital and irreplaceable

recognize fully the serious implications of degradation.[44] In the meantime, we have benefitted from the services provided by natural processes without regard for their value.[45] Given that most ecosystem services are not priced or exchanged in the marketplace,[46] it is necessary to consider governmental intervention to preserve the functionality of ecosystems. Fifteen years ago, Professor Robert Adler hailed the "resurgence in the watershed approach" to ecosystem and watershed protection.[47] With this resurgence, we are realizing that our interaction with and reliance upon watershed functions needs to be sustainable,[48] adaptive,[49] and planned.[50] Underlying each of these essential features is the need for a basis upon which to value watershed processes and functions. Identifying value affords an opportunity to include ecological processes in prioritization schemes and, in all likelihood, will result in more sustainable treatment.[51]

Scholars and planners have offered a variety of watershed protection programs,[52] suggesting this area of law is plagued by its complexity. As Tony Arnold notes, "few definitive conclusions can be made about the

role of the natural infrastructure that supports society. This natural infrastructure consists of all parts of Nature's web—wetlands, forests, grasslands, waters, riparian areas, fish, wildlife, and soils. Ecology is comprised of all of these elements working together as a whole.").

44 *See* James Salzman, *A Field of Green? The Past and Future of Ecosystem Services*, 21 J. LAND USE & ENVTL. L. 133, 134–37 (2006) (arguing that the historical lack of recognition of ecosystem services has come from ignorance, market economics, and institutional limitations).

45 *See* Heal et al., *supra* note 5, at 336–37 ("Ecosystems deliver these societal benefits 'for free' and, in many cases, on a scale so large that humanity would find it practically impossible to substitute for them.").

46 *See* Lawrence H. Goulder & Donald Kennedy, *Valuing Ecosystem Services: Philosophical Bases and Empirical Methods*, *in* NATURE'S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS, *supra* note 6, at 23, 28 ("Ecosystem services are especially difficult to measure for the same reason that ecosystems themselves are threatened. Many of the services provided by ecosystems are positive externalities. The flood-control benefits, water-filtration services, and species-sustaining services offered by ecosystems are usually external to the parties involved in the market decision as to whether and at what price a given habitat will be sold. As a result, the habitats that support complex ecosystems tend to be sold too cheaply in the absence of public intervention, since important social benefits are not captured in the price.").

47 Adler, *supra* note 29, at 977.

48 DAVID MONSMA ET AL., SUSTAINABLE WATER SYSTEMS: STEP ONE–REDEFINING THE NATION'S INFRASTRUCTURE CHALLENGE 6 (2009), *available at* http://www.ncppp.org/councilinstitutes/WaterInfrastructure.pdf.

49 Arnold, *supra* note 2, at 487 ("[W]atershed institutions and organizations will prove resilient and adaptive if they use the iterative, experimental, and adaptive processes of adaptive watershed planning to study, assess, and improve the process of adaptive watershed planning itself.").

50 MONSMA ET AL., *supra* note 48, at 6–7.

51 Gretchen C. Daily, *Valuing and Safeguarding Earth's Life-Support Systems*, *in* NATURE'S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS, *supra* note 6, at 365, 372 ("The safeguarding of ecosystem services will require that their value be explicitly incorporated into decision-making frameworks.").

52 *See, e.g.*, Ruhl et al., *supra* note 5, at 934–35; G. Tracy Mehan, III, *A Symphonic Approach to Water Management: The Quest for New Models of Watershed Governance*, 26 J. LAND USE & ENVTL. L. 1, 17–23 (2010); Jason Franklin & Kevin Halsey, *Ecosystem Services: A New Approach to Land Planning*, OR. PLANNERS' J., January/February 2011, at 3, 3–4, *available at* http://www.parametrix.com/profile/docs/Jan-FebOPJ.pdf.

effectiveness of watershed management, because so many different activities and efforts could fall within this broad category."[53] Variation among the stated goals and objectives of watershed protection may seem to trivialize any good faith efforts to understand its importance. Systemic interaction between so many distinct ecosystem processes and goods make it difficult to conceive of regulating watershed functionality on a sufficiently broad scale.[54] In addition, many of the more pervasive threats to watershed functionality—land conversion, impervious surfaces, and nonpoint source pollution—have historically been assumed benign and left inconspicuous in the public perception as well as in the regulatory scheme of environmental law.[55]

As agencies struggle to ensure clean and continuing water supplies and allocate them in an efficient and fair manner, some have called for the creation of new entities and concepts to manage watershed processes. The question is how to structure the watershed governing entity.[56] Most recognize the practical impossibilities implicated in Powell's boundary solution, identifying instead essential characteristics required to effectively manage watershed functions.[57] Here, the focus is on equipping communities and their local governments with the tools to recognize the value of watershed services and protect the functions that deliver those services.

Conceptually, the severance of land use from water allocation has allowed the regulation of each without regard to the interrelation between the two, a consequence that has been determinative in watershed management

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53 Arnold, *supra* note 2, at 430.

54 Jon Paul Rodriguez et al., *Interactions Among Ecosystem Services*, *in* 2 ECOSYSTEMS AND HUMAN WELL-BEING: SCENARIOS: FINDINGS OF THE SCENARIOS WORKING GROUP OF THE MILLENNIUM ECOSYSTEM ASSESSMENT 431, 447 (Steve R. Carpenter et al. eds., 2005) (discussing the difficulties of assessing trade-offs among ecosystem services in complex ecological circumstances).

55 *See supra* notes 2–4 and accompanying text; *see* Tarlock, *supra* note 2, at 149.

56 Watershed protection has historically has been confronted within a federalism framework, relating to the cooperative and often uncooperative schemes through which a host of environmental laws determine the level of treatment afforded to ecosystems. The dialogue on this issue, which revolves around the question of federalism, has focused on the difficulties of governing watershed functions from a national perspective. Jonathan Rosenbloom identifies four common themes that favor local control of environmental regulation: democratic representation, participation, decision-making efficiency, and social wealth maximization. Jonathan D. Rosenbloom, *New Day at the Pool: State Preemption, Common Pool Resources, and Non-Place Based Municipal Collaborations*, 26 HARV. ENVTL. L. REV. (forthcoming 2012), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1898270&download=yes; *see, e.g.*, Richard Briffault, *The Local Government Boundary Problem in Metropolitan Areas*, 48 STAN. L. REV. 1115, 1126–27 (1996) (noting that local governments are more apt to tailor policies to the particular needs of the community); Richard Briffault, *The Role of Local Control in School Finance Reform*, 24 CONN. L. REV. 773, 795 (1992) (noting that small, homogenous communities may be able to organize with fewer internal conflicts).

57 J.B. Ruhl and others have concluded that a watershed management authority must have 1) nested but centralized authority structured to establish democratic legitimacy, 2) authority and the responsibility to seek comprehensive watershed accountings and solutions, 3) authority to compel participation, 4) a multidisciplinary and accountable capacity, and 5) standardized and generalizable operational mechanisms. Ruhl et al., *supra* note 5, at 934–35. Tracy Mehan calls for collaborative watershed managers to take on a "symphonic," pluralistic approach to management decisions. *See* Mehan, *supra* note 52, at 13–17.

effectiveness.[58] Structurally, the patchwork system of laws governing ecosystems, watersheds, and their processes have proven ineffective at keeping watershed processes intact, at least to the extent of emulating a mode in governance driven by ecosystem boundaries, leading some to argue that "our major environmental laws' inability to protect ecosystems is intentional."[59] Indeed, there seems to be a significant rights- and allocation-bias in property and natural resources laws that includes laws designed to insure freedom to take goods from ecosystems, laws that are protective of activities that are harmful to watershed processes, and laws that address discrete components of ecosystem and watershed functionality, but do not do so in a coordinated or comprehensive manner.[60] As such, an argument to include local governments in watershed planning and management begins with the need to address land use in watershed protection.[61]

The problem has been that many are reluctant to place too much control in the hands of local governments. Parochialism—defined inclusive of jurisdictional concerns and limitations—is the basis for much of the reluctance to cede local control over environmental regulation.[62] However, it is important to grasp the fundamental idea that the differences between the national, centralized management of water quality and the local, parochial drivers of watershed management present multiple opportunities, rather than a hegemony of worst-option-last alternatives. Many of the ways that local watershed interests and perspectives differ from centralized perspectives seem less superfluous than essential.

Criticisms of local involvement in watershed management rely on a history in which local governments acted—and failed to act—through a lack of sophistication, persistence, or drive to envision watershed health on a watershed scale.[63] For instance, it has been noted, "effective watershed

58 Tarlock, *supra* note 2, at 162–63 (noting that the lack of control by local governments over water allocation leads to the detachment of water from land use). Rights to appropriate water for private uses are controlled by state law. *Id.* at 163–64. In the past, state water policy has been characterized by encouragement in "removing the river's natural behavior or hydrography as a constraint on watershed development." *Id.* at 164.

59 Heal et al., *supra* note 5, at 342.

60 *Id.* (noting that federal environmental laws are intentionally designed to protect narrow interests related to ecosystems—human health, specific species, or multiple land uses—but not the ecosystems themselves).

61 CTR. FOR WATERSHED PROT., RAPID WATERSHED PLANNING HANDBOOK: A COMPREHENSIVE GUIDE FOR MANAGING URBANIZING WATERSHEDS 2.3 (reprt. 2001) (1998) ("Since impervious cover has such a strong influence on subwatershed quality, a watershed manager must critically analyze the degree and location of future development (and impervious cover) that is expected to happen in a watershed. Consequently, watershed planning ranks as perhaps the single most important watershed protection tool.").

62 *See, e.g.*, John D. Echeverria, *No Success Like Failure: The Platte River Collaborative Watershed Planning Process*, 25 WM. & MARY ENVTL. L. & POL'Y REV. 559, 560, 579–80 (2001) (recapping one attempt to craft a watershed plan); Sean Callagy, Comment, *The Water Moratorium: Takings, Markets, and Public Choice Implications of Water Districts*, 35 ECOLOGY L.Q. 223, 225 (2008) (arguing that insulated water districts do not insure fairness in the allocation of local water supplies).

63 Tarlock, *supra* note 2, at 150 (stating that the case for federalism is strong "in part because local governments were slow to deal with many environmental problems, and when

management regimes cannot rely exclusively on the initiative of local governance, particularly if channeled through conventional local political entities. Even putting aside the lack of match between conventional local political boundaries and watersheds, local governments face several constraints to effective watershed management."[64] The warning is obviously sage. Local governments have been reluctant to engage in the types of scientific analysis that have supported the legitimacy of federal environmental law.[65] Local governments are typically unable to force their governmental neighbors to participate in watershed collaborations or, for that matter, to enforce watershed promises made.[66] Local governments may be uneasy about becoming solely responsible for the expense of watershed management and may avoid "mak[ing] economic sacrifices not being made by others."[67] Moreover, relative to watershed needs, local governments have traditionally exercised their regulatory powers in a piecemeal and narrow fashion.[68]

The ecosystem services perspective can help to clarify the role of local governments in watershed planning.[69] Ecosystem services places a focus on beneficiaries. Specifically, the ecosystem services approach provides a beneficiary-based accounting of ecosystem value,[70] and the approach thereby provides insights into the reasons that local governments are essential partners in watershed planning. Local governments, as the governing bodies of ecologically situated communities, are critical to ecosystem services protection because of the codependency between ecosystems utility and the character of local communities. Community character is, in an important

they did exercise their powers to define and prevent common law nuisances, the result was often to shift pollution to other areas").

64 Ruhl et al., *supra* note 5, at 937.

65 *See* Keith H. Hirokawa, *Sustaining Ecosystem Services Through Local Environmental Law*, 28 PACE ENVTL. L. REV. 760, 773–74 (2011) (discussing differences between the federal and local governments in the way they engage in environmental law).

66 *See id.* at 794 (recognizing the fear that "extra-jurisdictional dynamics will toll against cooperation in the management of ecosystem function," but pointing to a successful multijurisdictional effort in Saratoga County, New York, as an example of cooperation between local governments).

67 Ruhl et al., *supra* note 5, at 937.

68 Tarlock, *supra* note 2, at 166–67.

69 It should be asked whether this perspective on the potential of local governments to manage watersheds accurately depicts the circumstances, challenges, or even potential of local governments. Although it is expressly denied that local governments should be excluded from watershed management projects, the manner in which local governments are described makes it problematic to seek local participation or relegate watershed duties to local governments. For instance, this position does not explain why some local governments are active in protecting common pool resources in seemingly arbitrary fashions. *See* Rosenbloom, *supra* note 56, at 23 (explaining that while an agreement by the Conference of Mayors to reduce greenhouse gas emissions may appear like a municipal collaboration, in fact the cities involved are adopting local ordinances "with only minimal amounts of sharing information").

70 *See, e.g.*, Salzman, *supra* note 44, 135–36 (arguing that transaction costs are too high in markets for ecosystem services unless there are "discrete groups of buyers (service beneficiaries) and sellers (service providers)").

sense, a product of how the community perceives of and values its accessible ecosystem services.[71] Austin, Texas declares:

> Austin's sense of itself and its future are linked to water: from tree-lined creeks to Barton Springs and the Highland Lakes. The history of protecting these common assets involves citizens from many walks of life and reflects our community's shared values. Citizens and elected officials recognize the relationship between our region's vitality and its physical variability, which makes some watersheds more environmentally sensitive than others to water pollution. While some watersheds are more sensitive, others may actually affect Lake Austin and Town Lake, our principle sources of drinking water.[72]

Local governments are the places where ecosystem services may have tangible meaning to the beneficiaries.[73] The continuing receipt of watershed services—e.g., water provision, water filtration, flood and climate control, wildlife habitat—is considered essential, and localities frequently participate in or even exert an influence over watershed investments.[74] In some cases, local governments have been able to muster the expertise necessary to implement even the most technical programs to secure a local benefit.[75] As such, we are witnessing the adoption of watershed perspectives in local land-use planning processes to capture a broad array of ecosystem benefits—not just to secure clean water, but also to provide recreational or scenic opportunities, to contribute to climate governance, or to meet the pressing biodiversity demands of our times.[76] When faced with the insights of ecosystem services valuation of watersheds, local governments and their constituent communities become essential

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71 *See, e.g.*, WILLIAM B. LABIOSA ET AL., THE SOUTH FLORIDA ECOSYSTEM PORTFOLIO MODEL—A MAP-BASED MULTICRITERIA ECOLOGICAL, ECONOMIC, AND COMMUNITY LAND-USE PLANNING TOOL 2, 31 (2009), *available at* http://pubs.usgs.gov/sir/2009/5181/sir2009-5181.pdf.

72 City of Austin, *Watershed Protection Department: Watershed Ordinance History*, http://www.austintexas.gov/page/watershed-protection-ordinance (last visited Feb. 18, 2012).

73 Local governments are presented with a different range of interests to consider in tradeoff analyses. Of course, in its implementation of the water quality regime set forth in the Federal Water Pollution Control Act (Clean Water Act), 33 U.S.C. §§ 1251–1387 (2006), the Environmental Protection Agency (EPA) or particular states may be asked to weigh the comparative needs of neighboring towns as they allocate pollutant loads or designate water quality standards, and as such, may be required to consider local economies, population trends, or other cultural and socio-economic needs in the process of prioritization. However, when a city or county receives complaints about foul tastes and odors in the local drinking water, dwindling water supplies, or algae blooms at the local swimming hole, it faces a political and policy-driven dilemma concerning very personal public management choices. *See, e.g.*, U.S. ENVTL. PROT. AGENCY, MISSOURI: SPRINGFIELD: GROWTH CONCERNS SPUR WATERSHED MANAGEMENT (2010), *available at* http://water.epa.gov/infrastructure/drinkingwater/sourcewater/protection/casestudies/upload/Source-Water-Case-Study-MO-Springfield.pdf (discussing the birth of source water protection from citizen complaints about odor and taste in drinking water).

74 *See id.* (discussing the actions of the community against an official's recommendation that the local watershed coordinating committee be terminated).

75 Dave Owen, *Urbanization, Water Quality, and the Regulated Landscape*, 82 U. COLO. L. REV. 431, 483 (2011) (explaining that the Long Creek restoration process "shows that real environmental management expertise and creative potential exist at local levels").

76 *See* Hirokawa, *supra* note 65, at 773–74.

stakeholders in watershed planning and management because this analysis focuses on local priorities and preferences as drivers for ecological, economic, and political decision making.

One distinct advantage of thinking from a beneficiary perspective is that it provides a context for consideration of tradeoffs in watershed choices. Ecosystem investments may yield a wide range of cobenefits in ecosystem services through the restoration of ecosystem processes that offer services beyond the prioritized service, or due to the indirect creation or restoration of secondary ecosystem processes.[77] Moreover, attention to cobenefits, as well as a thorough understanding of the intersection of ecosystem services benefits and demand for those services, will often reveal the ways in which ecosystem services protection will simultaneously benefit several different priorities.[78] These cobenefits may have enormous economic value to local and regional communities of beneficiaries, and so they are relevant to the valuation of watersheds.

Moreover, it is important to note that the range of potential solutions to any given impairment of ecosystem services seldom converges on one identifiable threat or direction.[79] Rather, the end product of an ecosystem services analysis is a full estimate of consequences—costs and benefits—for an informative range of alternative scenarios that illuminates and accounts for the relevant tradeoffs.[80] Once it is recognized that public facilities and services investments have the potential to provide a broad array of cobenefits to human health and social welfare, it may be more easily seen that all land-use choices are essentially hegemonic choices about different menus of ecosystem services.[81]

Local governments may be better arbiters for ecosystem services menu options. Local participation has been seen as "essential for viability" of conservation of ecosystem functionality, at least because "engaging those who know most about the land and its management in decision making can lead to employing the most effective strategies."[82] Moreover, failure to include localities in watershed planning activities risks elimination of

77 *Cf.* Chan et al., *supra* note 20, at 2139 (discussing how looking past benefits yielding only "private gains" could expand the "scope for ecosystem services provision to yield gains for conservation").

78 *See id.* at 2150 (analyzing the tradeoffs and coordination of ecosystem services conservation choices).

79 *See id.* at 2149.

80 *See id.* at 2149–50.

81 Rodriguez et al., *supra* note 54, at 443 ("Real-world examples support the contention that managers must make trade-offs that explicitly or implicitly lead to preferences among ecosystem services.").

82 Rebecca L. Goldman & Heather Tallis, *A Critical Analysis of Ecosystem Services as a Tool in Conservation Projects: The Possible Perils, the Promises, and the Partnerships*, 1162 ANNALS N.Y. ACAD. SCI., no. 2, Apr. 2009, at 63, 74; *see also* Katrina Fischer Kuh, *Using Local Knowledge to Shrink the Individual Carbon Footprint*, 37 HOFSTRA L. REV. 923, 937 (2009) (pointing out that local governments "possess local information integral to prioritizing which lifestyle/behavior changes to seek in a community and, once those are identified, how best to go about achieving those changes").

perspectives and participation in this exercise, a result that tolls against the goals of watershed planning and ecosystem services:

> Creating a governing entity that is both a financial and institutional body gives voice to funders' concerns as well as other user-group concerns and brings together a unique group of stakeholders in a structured, diplomatic manner. . . . Bringing all stakeholders together to administer a pool of financial resources gives voice to the financial, ecological, and social and human welfare concerns in an area.[83]

Voice for local governments infuses into watershed planning a concern and perspective for which centralized institutions have been given no directive—a personal, human, and place-based stake.[84]

At least, the beneficiary approach to ecological value provides greater insights into the manner in which functioning watersheds serve social needs. Hence, as Tracy Mehan notes, "If watershed management is going to be effective, it must address the human dimension as well as hydrology, soil science, biology, and water chemistry. For this reason, watershed governance requires reinventing the watershed as a social as well as a scientific reality."[85] Local governments need functioning ecosystems, whereas the same cannot necessarily be said for other governmental entities. In some cases, local governments derive economic advantage through the production of ecosystem goods such as fisheries and timber or ecosystem services such as the provision of recreation and tourism

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83 Goldman & Tallis, *supra* note 82, at 74.

84 Carol Rose has suggested that we need local governance of land-use decisions to guarantee a linkage between how decisions are made and our values:

> The symbolic meanings and values attached to aesthetic tastes vary enormously and are based on polycentric criteria not easily standardized. It may be that we do not want to entrust decisions about such matters to coalition-building legislatures at all, preferring these decisions to be made by people we trust because we have chosen to live with them, and because we sense our influence on them. Moreover, we may prefer that such decisions be made individually. It is not enough to trade a shopping center here for an apartment project there; we want individual consideration of each on its merits. . . . These are decisions where quality matters especially, and we want them made where we have voice—or the ultimate possibility of exit.

Carol M. Rose, *Planning and Dealing: Piecemeal Land Controls as a Problem of Local Legitimacy*, 71 CAL. L. REV. 837, 911 (1983). In Hawai'i, the Coastal Zone Management Program has opined in a similar tone in its watershed planning guidance:

> Watershed planning and implementation is a community-based process. Research has shown that the greatest chance for a watershed plan's success is when stakeholders are brought into the process at the beginning of the planning effort. Implementation of watershed plans is ultimately the primary responsibility of government agencies, but community support and action are vital beyond the plan development. People are more likely to take action if they support the plan and feel that their concerns are being addressed.

TETRA TECH EM, INC., HAWAI'I WATERSHED GUIDANCE 8 (2010), *available at* http://hawaii.gov/dbedt/czm/initiative/nonpoint/HI%20Watershed%20Guidance%20Final.pdf.

85 Mehan, *supra* note 52, at 16.

opportunities.[86] In others, local governments identify themselves with such features and attributes of the local environment: "Natural ecosystems and natural elements (such as ancient water falls or old trees) provide a sense of continuity and understanding of our place in the universe which is expressed through ethical and heritage-values."[87] EPA has recognized this special relationship between communities and nature's services:

> We live among, and are deeply connected to, the many streams, rivers, lakes, meadows, forests, wetlands, and mountains that compose our natural environment and make it the beautiful and livable place so many of us value. More and more often, human communities realize that the health and vibrancy of the natural environment affects the health and vibrancy of the community and vice versa. We value the land, air, and water available to us for material goods, beauty, solace, retreat, recreation, and habitat for all creatures. Throughout the nation, communities are engaging in efforts to protect these treasured natural resources and the quality of life they provide.[88]

Communities garner the benefits of watershed services and have distinctly local and group interests that drive their governance of the lands and waters around them.

IV. USING INFORMATION ON WATERSHED SERVICES AS THE DRIVER OF LOCAL WATERSHED GOVERNANCE

Especially at the local level, ignorance explains a great deal about past practices and interactions with the environment.[89] In order to drive local governments toward effective watershed governance, communities must understand that functioning watersheds provide the valuable services on which they depend. As noted in the Millennium Assessment reports:

> To prevent irreversible damage to natural systems, we must make sweeping changes in the way we use—and think about—natural resources. Fortunately, we have the knowledge and the technology we need to make those changes. But change of the required magnitude is unlikely to happen as long as nature's services are perceived as free and limitless. The first order of business, then, is to value nature's services—to understand their contribution to human well-

86 *See, e.g.*, Robin Kundis Craig, *Valuing Coastal and Ocean Ecosystem Services: The Paradox of Scarcity for Marine Resources Commodities and the Potential Role of Lifestyle Value Competition*, 22 J. LAND USE & ENVTL. L. 355, 398–406 (2007) (discussing examples where state and local governments acted to protect local values in marine recreational and aesthetic resources).

87 Rudolf S. de Groot et al., *A Typology for the Classification, Description and Valuation of Ecosystem Functions, Goods and Services*, 41 ECOLOGICAL ECON. 393, 402 (2002).

88 U.S. ENVTL. PROT. AGENCY, EPA 842-B-01-003, COMMUNITY CULTURE AND THE ENVIRONMENT: A GUIDE TO UNDERSTANDING A SENSE OF PLACE 2 (2002), *available at* http://www.epa.gov/care/library/community_culture.pdf.

89 Salzman, *supra* note 44, at 134.

being, and then to design policies and practices that allocate these costs in an equitable way.[90]

Improving the capacity of local governments to engage in watershed governance begins with establishing the value of watersheds to the community—not just in abstract terms, but also in concrete dollars and cents. A focus on information will enable the type of valuation analysis that is necessary to drive sound decision making to protect functioning watersheds.[91] Yet much of land-use planning has fallen short.[92] What is needed is a focus on local information that supports an accurate accounting of the value of watershed services.[93] The starting point concerns aligning an understanding of watershed processes with the value of watershed benefits.

Although this Article does not aim to accomplish the larger project—designing the optimal institutional structure of local governments to implement sustainable and adaptive watershed management programs[94]—helpful clues can be taken from the insights of ecosystem services valuation and the innovations seen in local watershed governance across the nation. Indeed, there is no shortage of examples of community-based watershed initiatives.[95] In 2000, the Environmental Protection Agency (EPA) reported on watershed management programs across the country, many of which

90 MILLENNIUM ECOSYSTEM ASSESSMENT: A TOOLKIT FOR UNDERSTANDING AND ACTION 7 (Island Press 2007), *available at* http://islandpress.org/assets/library/27_matoolkit.pdf.

91 Of course, for over 40 years, environmental laws have included an informational component in the National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321–4347 (2006), and an impressive array of natural resource statutes. Nevertheless, it is questionable whether the existing statutes are equipped to accommodate ecosystem services valuation. *See, e.g.*, Clinch Coal. v. Damon, Jr., 316 F. Supp. 2d 364, 377 (W.D. Va. 2004) (holding that natural resource statutes did not require an ecosystem services analysis).

92 Devin Judge-Lord & Bobby Cochran, *Putting Ecosystem Services to Work: Institutional Changes Needed to Implement an Ecosystem-Based Plan*, OR. PLANNERS' J., January/February 2011, at 7, 10, *available at* http://centralpt.com/upload/342/OPJArchives/12874_1-2011Jan-FebOPJ.pdf. ("Most plans fail to quantify many of the benefits provided by natural areas and link them to the well being of a community. For example, a natural areas inventory may not quantify the contribution of those natural areas toward protecting cool, clean sources of drinking water. Industrial site selection might not articulate the cumulative impacts to wetland functions like flood storage and delay. Analysts need to combine land-use overlays with ecosystem service models.").

93 Yet this is a difficult project. As noted by the Millennium Ecosystem Assessment: "Perhaps the most significant methodological challenge is to develop the capacity for a place-based approach to assessment, which is necessary to identify ecosystem functions that support the provision of valued ecosystem services in a specific context, and to select feasible and appropriate institutional arrangements." Bruce Aylward et al., *Freshwater Ecosystem Services*, *in* MILLENNIUM ECOSYSTEM ASSESSMENT, 3 ECOSYSTEMS AND HUMAN WELL-BEING: POLICY RESPONSES 213, 221 (2005).

94 *See, e.g.*, Adler, *supra* note 29, at 1037–38 & nn.387–90 (providing an inventory of regulatory controls relevant to and authorizing watershed protection).

95 Under National Estuary Programs, community-based watershed management organizations plan for the protection and restoration of coastal watersheds. U.S. ENVTL. PROT. AGENCY, EPA-842-B-05-003, COMMUNITY-BASED WATERSHED MANAGEMENT: LESSONS FROM THE NATIONAL ESTUARY PROGRAM ix (2005), *available at* http://www.epa.gov/owow/estuaries/nepprimer/documents/NEPPrimer.pdf.

received substantial support from President Clinton's Clean Waters Action Plan, and narrated the successes of thirty different watershed partnerships.[96] In its report, EPA emphasized the importance of stakeholder participation to insure that watershed management strategies and innovations are responsive to local, place-based water quality challenges.[97] EPA concluded that involvement and support of local efforts "will make all of our waters fishable, swimmable and drinkable for future generations."[98]

More recently, efforts to increase the governing capacity of local governments have resulted in insightful innovations in watershed planning and management. The information generated in an ecosystem services valuation has resulted in the creation of profoundly effective tools: with an ecosystem services valuation, planners are able to balance the interests of competing land uses, analyze the costs of certain tradeoffs,[99] and "demonstrate progress toward conservation goals and compliance with federal law."[100] In the meantime, local governments are able to understand the linkages between local governance and ecosystem functionality[101] and are acting in a more accountable manner.[102]

A. Acquiring Information About Watershed Services and Needs

Information is the most essential component in Professor Gretchen Daily's insistence that "[t]he safeguarding of ecosystem services will require that their value be explicitly incorporated into decision-making frameworks."[103] Employing the ecosystem services analysis to identify

96 CLEAN WATER ACTION PLAN, WATERSHED SUCCESS STORIES: APPLYING THE PRINCIPLES AND SPIRIT OF THE CLEAN WATER ACTION PLAN 3 (2000).

97 *Id.* at 3–4.

98 *Id.* at 4.

99 It is important to note that the use of ecosystem service information by local governments may diverge from its value to federal agencies. Specifically, the value of information about functional ecosystems helps us make difficult land-use decisions involving tradeoffs. As noted in the Millennium Ecosystem Assessment reports:

> Ecosystem services do not operate in isolation. They interact with one another in complex, often unpredictable ways. Many services are provided by ecosystems in interdependent "bundles." By choosing one bundle, other services may be reduced or foregone. For example, impounding streams for hydroelectric power may have negative consequences for downstream food provisioning by fisheries. Knowledge of the interactions among ecosystem services is necessary for making sound decisions about how society manages the services provided by nature.

Rodriguez et al., *supra* note 54, at 433 (citation omitted).

100 Judge-Lord & Cochran, *supra* note 92, at 11.

101 For this discussion, see Keith H. Hirokawa, *Sustainability and the Urban Forest: An Ecosystem Services Perspective*, 51 NAT. RESOURCES. J. 233 (2011).

102 Travis Greenwalt & Deborah McGrath, *Protecting the City's Water: Designing a Payment for Ecosystem Services Program*, 24 NATURAL RESOURCES. & ENV'T, Summer 2009, at 9, 9–10, *available at* http://www.cwsd.org/newcms/admin/Uploads/NREarticle.pdf ("Studies of water utilities across the United States show that every dollar invested in watershed protection saves tens to hundreds of dollars in water treatment costs.").

103 Daily, *supra* note 51, at 372.

economic values for otherwise invisible services provided by ecosystems involves a sincere effort 1) to identify the services provided in a functional watershed, including those services which are relevant to a particular watershed; 2) to identify linkages between the relevant ecosystem services and human welfare within watershed beneficiaries; and 3) to assess the value of ecosystem functionality, primarily found in the relationship between the services provided and existing needs.

One example of the local information-gathering exercise has been led by Anne Arundel County, Maryland, which has received honors for actively pursuing green infrastructure and ecosystem services protection.[104] Anne Arundel County formed the Watershed Ecosystem and Restoration Services Division (WERS) within the Department of Public Works to inventory and assess the County's natural capital and assist in the County's compliance with federal and state environmental laws.[105] WERS expressly defines the purpose of the Ecological Assessment Program to link ecosystem quality to "the necessity of executing projects that will maintain and improve the quality of life for County residents."[106] WERS staff members assigned to the County's Watershed Assessment and Planning Program developed a mapping application to support a layered geographic information system database based on field data so that its residents will be able to easily track the management and restoration projects alongside the overlapping ecosystem needs and services provided in the various watersheds.[107] This tool "is aimed at prioritizing restoration and preservation recommendation actions and includes a cost/benefit analysis, feasibility study, and development of conceptual plans."[108] These initiatives ensure compliance with the National Pollutant Discharge Elimination System program and serve to identify new restoration projects as well as to monitor existing

104 In 2002, the County was the recipient of the Governor's Smart Growth award for government innovation. MARK BENEDICT & JOY DROHAN, MARYLAND'S GREEN INFRASTRUCTURE ASSESSMENT AND GREENPRINT PROGRAM 9–10 (2004), *available at* http://www.greeninfrastructure.net/sites/greeninfrastructure.net/files/1-mdgreeninfrastructurecasestudy.pdf. In 2003, the County was honored by the Maryland chapter of the American Planning Association for their greenways master plan. *Id.* at 9.

105 Dep't of Pub. Works, Anne Arundel Cnty., Md., *Watershed Ecosystem and Restoration Services*, http://www.aacounty.org/DPW/Watershed/index.cfm (last visited Feb. 18, 2012) ("The division develops and delivers technical environmental assessment, planning, and implementation information and regulatory support to the Department of Public Works, Inspections and Permits; and Planning and Zoning. This support enables these agencies to carry out their responsibilities for successfully managing delegated programs outlined in the County's National Pollutant Discharge Elimination Systems Permit (NPDES-MS4), the State's Critical Area program, and the State Forest Conservation Act, as their responsibilities for land use decisions set fourth [sic] in the County Code.").

106 *See* Dep't of Pub. Works, Anne Arundel Cnty., Md., *Ecological Assessment Program*, http://www.aacounty.org/DPW/Watershed/EcologicalAssessmentProgram.cfm (last visited Feb. 18, 2012).

107 *See* Anne Arundel Cnty., Md., *Watershed, Ecosystem, and Restoration Services Mapping Application*, http://gis-world.aacounty.org/wers/ (last visited Feb. 18, 2012).

108 *See* Dep't of Pub. Works, Anne Arundel Cnty., Md., *Watershed Assessment and Planning Program*, http://www.aacounty.org/DPW/Watershed/watershedassessment.cfm (last visited Feb. 18, 2012) .

projects.[109] In addition, WERS has partnered with the United States Fish and Wildlife Service to conduct stream assessments and investigations to support the County's efforts in inventorying the County's watershed needs, threats, and restoration opportunities.[110] At present, Anne Arundel County is growing close to completing its comprehensive assessments of the subwatersheds in its jurisdiction and assessing that information to derive priorities for water quality management and watershed restoration projects.[111]

A second, fascinating example of an intensive and quite local exercise of local information gathering is occurring in the Portland, Oregon metropolitan area. The City of Damascus, Oregon was thrust into the planning process with its inclusion in the Portland Urban Growth Boundary in 2002, followed by the City's incorporation in 2004.[112] Damascus covers 10,333 acres and has a population of nearly 10,000 people, with projected growth to 50,000 residents by 2060.[113] Especially relevant for purposes of this Article is the fact that only ten percent of the area is currently served by infrastructure.[114] The cost for constructing built infrastructure and public services was estimated at $3 to $4 billion.[115]

The City concurrently engaged the planning process to develop both a comprehensive land-use plan and an ecosystem services master plan.[116] Residents collaborated to create a list of core values which served to guide the priorities and goals of the planning process.[117] Among other things, the residents identified effective transportation, employment opportunities, and preservation of the area's rural character as core values.[118] In the process, the city considered "pursuing an approach that explicitly accounts for changes in natural capital and its ability to provide valued ecosystem services."[119] The

109 *Id.*; Dep't of Pub. Works, *supra* note 105.

110 *See* RICHARD R. STARR, U.S. FISH & WILDLIFE SERV., CBFO-S09-01, STREAM ASSESSMENT PROTOCOL: ANNE ARUNDEL COUNTY, MARYLAND 1 (2009), *available at* http://www.fws.gov/chesapeakebay/pdf/1new%20stream%20reports/S09-01.pdf.

111 For the County's Watershed Implementation Plan documents and list of priorities, see generally Dep't of Pub. Works, Anne Arundel Cnty., Md., *Comprehensive Watershed Management Studies*, http://www.aacounty.org/DPW/Watershed/WatershedStudies.cfm (last visited Feb. 18, 2012).

112 Anita Yap et al., *Ecosystem Services & City Planning: The City of Damascus Develops a Model Approach to Public Facilities Planning*, OR. INSIDER, Aug. 2009, at 1, 1.

113 *See* ECONORTHWEST ET AL., CITY OF DAMASCUS: COMMUNITY ATLAS i (2007), *available at* http://www.ci.damascus.or.us/references/misc/Community%20Atlas.pdf; Steve Gaschler et al., Presentation at the Oregon Water Conference: Building a Legacy: Integrated Water Resources Management in Damascus, Oregon (May 25, 2011), *available at* http://ir.library.oregonstate.edu/xmlui/handle/1957/23213 (noting a population projection of 50,000 by 2060); *see also* City of Damascus, *Departments: Community Development: Documents*, http://www.ci.damascus.or.us/departmentscommunitydevelopmentdocuments.aspx (last visited Feb. 18, 2012).

114 *See* Yap et al., *supra* note 112, at 4.

115 *Id.*

116 *Id.* at 3, 9.

117 *See generally* CITY OF DAMASCUS, ENVISION DEMASCUS: COMPREHENSIVE PLAN 1-5, 2-5 to -7 (2010), *available at* http://ci.damascus.or.us/References/Misc/FINAL%20AdptComp%20PlanOrd22010-45-121410.pdf.

118 *Id.* at 2-5 to -6.

119 Yap et al., *supra* note 112, at 1.

Damascus city council sought to maintain low density development standards to facilitate the City's use of ecosystem services as a component of its utility infrastructure and storm water management, under which the city would control utility costs by integrating streams and other natural features into its water and sewage treatment infrastructure.[120] This choice of methodology was expressly intended to defray the costs of developing public infrastructure from scratch:

> By including ecosystem services in the [public facilities plan] as an essential system, Damascus aims to forestall increased costs to the citizens of Damascus. These increased costs take the form of built infrastructure to replace the service (as in stormwater management), increased regulatory compliance hurdles (as in Clean Water Act[121] and Endangered Species Act[122] compliance), and loss of quality of life.[123]

In the first Tier of its ecosystem services planning, the City prepared a public facilities plan that mapped the existing ecosystem services provided by the City's natural capital.[124] This information resulted in the development of an existing "relative level of service (LOS)" that incorporated the location and quality of the ecosystem services.[125] The City's Tier II analysis is intended to explore mechanisms to establish, implement, and protect the ecosystem services LOS for the benefit of Damascus residents.[126] Staff presented a Phase II analysis in September, 2010.[127]

In addition, Damascus cooperated with regional service providers to develop an Integrated Water Resource Management Plan (IWRMP) "to establish an integrated, cost-effective, and sustainable approach for providing water, wastewater, reclaimed water, and stormwater services to new and existing development in the City."[128] The IWRMP built on the City's core values and considered thirteen alternative infrastructure solutions to an effective water balance.[129] Community input and analysis resulted in an ecosystem service strategy for the "integration of water resource

120 *See* CH2MHILL, FINAL REPORT: PUBLIC FACILITIES PLAN 4-1 (2009), *available at* http://ci.damascus.or.us/References/Misc/Public%20Facilities%20Plan%20and%20Appendices.pdf.

121 Federal Water Pollution Control Act, 33 U.S.C. §§ 1251–1387 (2006).

122 Endangered Species Act of 1973, 16 U.S.C. §§ 1531–1544 (2006 & Supp. IV 2010).

123 Worksession, City of Damascus City Council, Ecosystem Services - Executive Summary from the Tier II Ecosystem Services Report, at ES-1 (2010), *available at* http://www.ci.damascus.or.us/council2010archive.aspx (click on "View" under the column labeled "Packet" for the "Sep 30 Council Work Session").

124 *Id.*

125 *Id.*

126 *Id.* at ES-1 to -2, ES-5.

127 Letter from Dave Green, City Eng'r, City of Damascus, to City Council Councilmembers, City of Demascus (Sept. 30, 2010), *available at* http://www.ci.damascus.or.us/MeetingFiles/201009301830-a3a9505b-5cab-44d7-bac0-8791881a92d3-Packet.pdf.

128 CH2MHILL & CITY OF DAMASCUS, DAMASCUS INTEGRATED WATER RESOURCES MANAGEMENT PLAN: DRAFT REPORT ES-1 (2011).

129 *Id.*

management to reduce water quality impacts, manage the hydrology of existing streams and aquifers, and reduce infrastructure costs."[130]

The Damascus City Council voted to adopt its comprehensive plan in December of 2010.[131] The City's vision of community development prioritized alternatives that create or enhance ecosystem cobenefits through the integration of ecosystem processes, such as an open space provision as a component of water storage and treatment.[132]

B. Driving Public Awareness of Watershed Information

After some reflection on the early ecosystem services implementation projects, researchers are finding that the ecosystem services approach "expand[s] the breadth of landscapes upon which conservation efforts are employed, particularly on agricultural landscapes where new stakeholders are engaged in sustainable land-use practices."[133] In the meantime, ecosystem services projects have something different, perhaps more tangible to offer, as evidenced by ecosystem service projects that "draw in new funders, particularly private, corporate funders."[134] For some types of programs, such as "payment for ecosystem services" (PES) and similar market-based mechanisms, it matters how ecosystem improvement projects are packaged.[135] For purposes of this Article, it may be more important to consider how local governments are able to garner public support for ecosystem investments: "A public outreach campaign should educate water consumers about the threats to water supply and demonstrate that proactive watershed-protection measures cost significantly less than alternatives associated with watershed degradation."[136] A current example of such a strategy exists in New Mexico.

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130 *Id.* at 1-4 to -5.

131 Natalie Feulner, *Damascus Goes for Density with New Plan*, OREGONIAN, Dec. 18, 2010, at E1.

132 CH2MHILL & CITY OF DAMASCUS, *supra* note 128, at 2-2 tbl.2-1.

133 Goldman & Tallis, *supra* note 82, at 75 (analyzing the differences and overlap between conservation projects focused on biodiversity and those driven by ecosystem services).

134 *Id.*

135 PES experiments have been touted as the most important advancement in ecosystem valuation. Chan et al., *supra* note 20, at 2138. What the PES movement adds is that governance of ecosystem services may involve an effort to recognize that the burdens of preserving natural capital result in valuable capital assets. *See, e.g.*, U.N. FOOD & AGRIC. ORG., PAYMENT SCHEMES FOR ENVIRONMENTAL SERVICES IN WATERSHEDS 1 (2004) (noting that "[t]he basic idea of PES schemes is to create a market for an environmental good, which usually is priceless").

136 Greenwalt & McGrath, *supra* note 102, at 11. Consider, for example, the Schuylkill Action Network, a source water protection program that was largely initiated through a Targeted Watershed Initiative Grant in 2004. SCHUYLKILL ACTION NETWORK, PROTECTING SCHUYLKILL WATERS, *available at* http://www.schuylkillwaters.org/doc_files/SWIG%20one%20pager.pdf. The 2000 square mile Schuylkill watershed provides drinking water for more than 1.5 million people but has a history of water quality impairments. *Id.*; *see generally* SCHUYLKILL ACTION NETWORK, SCHUYLKILL ACTION NETWORK: STRATEGIC PLAN: 2011–2015, at 7–9, *available at* http://www.schuylkillwaters.org/doc_files/2011-2015%20SAN%20Strategic%20Plan%20.pdf. This watershed initiative has engaged in an impressive array of projects aimed at improving water quality in the watershed, restoring functional habitat, and improving the public awareness of

The Santa Fe municipal watershed, which covers more than 17,000 acres in the Santa Fe river basin, delivers water supplies to approximately 30,000 homes and business.[137] However, Santa Fe's water supply is subject to the ever-present threat of forest degradation and fire catastrophe.[138] The city recognized that the cost of suffering a substantial forest fire in the watershed would be overwhelming due to the expenses of removing increased sedimentation, treating and filtering water supplies, and securing replacement water supplies.[139] To prepare for such an event, the City studied feasibility of avoidance scenarios intended to reduce the likelihood of forest fire.[140] The Municipal Watershed Plan was developed through a Forest Service grant and the collaboration of several stakeholders, including the Española Ranger District of the Santa Fe National Forest, City of Santa Fe Fire Department, City of Santa Fe Water Division, the Nature Conservancy, and the Santa Fe Watershed Association.[141]

Santa Fe developed a Master Plan to coordinate delivery of vegetation and water management needs, outreach and public participation, and financial management.[142] The Santa Fe Master Plan focuses on four significant areas of public cost. First, Santa Fe's Master Plan accounts for fire suppression costs at $50,000 to $100,000 for small, quickly contained fires, and $10 million for fires affecting 7,000 acres.[143] Second, Santa Fe notes that water treatment plants are often impaired by ash after fire and need maintenance and repair.[144] The Master Plan estimates a cost of $1 million to account for temporarily closing the treatment system and providing an alternate water supply.[145] Third, because of the significant accumulation of sediment following a forest fire, the Master Plan contemplates dredging of the reservoirs and disposal of the dredged sediments at an estimated cost of $10 million, with an additional $500,000 to complete the regulatory process for sediment disposal.[146] Finally, burned areas would increase the risks from erosion, ash flow, and intrusion by invasive species.[147] The

both the benefits derived from the Schuylkill watershed and the threats to watershed function. *See generally* Schuylkill Action Network, *Projects*, http://www.schuylkillwaters.org/projects.cfm (last visited Feb. 18, 2012).

137 ELLIS MARGOLIS ET AL., SANTA FE MUNICIPAL WATERSHED PLAN, 2010–2029, at 2 (2009), *available at* http://www.santafenm.gov/DocumentView.aspx?DID=4354.

138 *Id.*

139 *Id.* at 11 (finding that "the avoided cost, [from protecting the watershed] estimated by calculating the expense that would result from a 7,000 acre fire in the watershed is $22 million").

140 *Id.* at 1.

141 *Id.* at 1, 3.

142 *Id.* at 1.

143 *Id.* at 85 ("If lightening starts in the Santa Fe watershed and is contained quickly and at less than 100 acres, the cost is estimated to be from $50,000–$100,000. If a fire burns 7,000 acres within the Santa Fe watershed, the projected cost would be approximately $10 million. The costs of a fire on the scale of the 2000 Cerro Grande fire would increase exponentially.").

144 *Id.*

145 *Id.*

146 *Id.*

147 *Id.*

Master Plan estimates the costs of post-fire rehabilitation to reach approximately $500,000.[148]

Santa Fe is tapping into the power of sustaining wholesale consensus as a basis for wholesale change.[149] Recognizing the potential political hurdles that typically accompany increased utility fees, the city has embarked on a public education and awareness campaign to convince its residents that the ecosystem services approach will constitute a positive investment.[150] Because of the essential need for public support,[151] and because public support takes time, the city has opted to delay the implementation of its PES fee:

> Because gaining public support for an additional rate increase associated with Watershed Management Plan PES would be difficult at this time, the watershed management partners are pursuing New Mexico Finance Authority, Water Trust Board funding to cover the City's PES obligations for the first five years of project implementation. Within this initial five-year period, outreach and education efforts will be focused on building public approval for PES and acceptance of the nominal rate increase associated with the Watershed Management Plan that would go into effect in 2014, when the Buckman Direct Diversion Project will be complete.[152]

Santa Fe has, thus, adopted a strategy of awareness to precede implementation, a strategy that has proven essential in other contexts where

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148 *Id.*

149 *Id.* at 75 ("While the Santa Fe Municipal Watershed plan has engaged key agency and non-profit agencies in its development, success of the overall watershed management plan also is dependent upon community and political support.").

150 The City's resolve to pursue public awareness prior to initiating its proposed PES program is supported in PES literature. *See, e.g.*, CARYN ERNST, LAND CONSERVATION AND THE FUTURE OF AMERICA'S DRINKING WATER: PROTECTING THE SOURCE 8, 33 (2004), *available at* http://cbey.research.yale.edu/uploads/Conservation%20Finance%20Camp%202011/agenda/Tuesday/protecting_the_source_04-1.pdf; KATOOMBA GRP. ET AL., PAYMENTS FOR ECOSYSTEM SERVICES: GETTING STARTED: A PRIMER 16 (2008), *available at* http://www.katoombagroup.org/documents/publications/GettingStarted.pdf; NELS JOHNSON ET AL., DEVELOPING MARKETS FOR WATER SERVICES FROM FORESTS: ISSUES AND LESSONS FROM INNOVATORS 14–15 (2001), *available at* http://www.forest-trends.org/documents/files/doc_133.pdf; Greenwalt & McGrath, *supra* note 102, at 10.

151 MARGOLIS ET AL., *supra* note 137, at 89 ("Other [PES] programs have found that open communication and accountability are critical in maintaining public confidence in water supply and management. For this reason, most publications recommend that proposed PES fees be made explicit to the public, following an aggressive outreach campaign. We recommend that the City include the PES fee as a separate line item in the water bill. This would promote the understanding and visibility of the PES program and would contribute to a more educated public about the true cost of maintaining ecosystem services in the watershed. The fee would be listed after initial outreach in Year 1. Beginning in Year 2, the fee would be listed within the water bill. While ecosystem services are paid for with Water Trust Board funding, the PES fee would appear as a credit on consumers' bills. In Phase 2 of the plan, the fee would be a real fee based on water use. Listing the fee as a credit during Phase 1 would allow four years for consumers to become familiar with the plan and the benefits and costs associated with implementing the PES plan." (citation omitted))

152 *Id.* at 11.

a demonstration of value is needed.[153] Notably, the city is leading the charge with a statement of the projected return on its proposed ecosystem investments: "The cost to retain the restored forest condition is estimated at $4.3 million, an average of $200,000 per year. In contrast, the avoided cost that would result from a 7,000 acre fire in the watershed is estimated at $22 million."[154]

Santa Fe's ability to convince its residents to acquiesce in the PES program will serve as an important indicator for other local governments. Over sixty percent of the world's population gets their water from a forested watershed.[155] As such, there is a direct relationship between watershed protection and clean drinking water.[156] Because of past practices of ignoring the value of ecosystem services, activities that consumed and transformed ecosystem processes have not been accounted for as costs. Land conversion to agriculture has resulted in loss of watershed functions related to the ability to absorb flood events, provide habitat, and influence water quality.[157] Timber harvesting and associated forest practices can cause significant water degradation, especially during storm events.[158] New Mexico is not the only community that has borne substantial water treatment costs following a major fire event. What is special about Santa Fe's example, however, is the manner in which the city is using this information.

C. Using Watershed Information

The recent resurgence of the watershed approach has left watershed management[159] in a bit of a quandary: the inability of political boundaries to adapt to watershed boundaries means that the watershed, as a planning unit, may have no logical or predetermined manager. As this dilemma is sorted out, and the debate on watershed management narrows the field, it will be increasingly important to remember that watershed investments—whether by local, state, or federal entities—are particularly relevant to the local beneficiaries of ecosystem services. Investments to watershed processes accrue locally *first*: investments in forest management practices near Santa

153 *See, e.g.*, Goulder & Kennedy, *supra* note 46, at 28–29 ("Public attention to the values of these (largely external) benefits is important to provide support for reasonable public policies to protect important habitats. This makes it all the more important to determine the values of these services."); Keith H. Hirokawa, *At Home with Nature: Early Reflections on Green Building Laws and the Transformation of the Built Environment*, 39 ENVTL. L. 507, 526 (2009) (discussing the "informational" approach to green building laws as a strategy for public acceptance).

154 MARGOLIS ET AL., *supra* note 137, at 1.

155 EARTH ECON., NATURE'S VALUE IN THE TERRABA-SIERPE NATIONAL WETLANDS: THE ESSENTIAL ECONOMICS OF ECOSYSTEM SERVICES 23 (2010).

156 Salzman et al., *supra* note 5, at 314–15.

157 *See* COMM. ON PROT. & MGMT. OF PAC. NW. ANADROMOUS SALMONIDS ET AL., UPSTREAM: SALMON AND SOCIETY IN THE PACIFIC NORTHWEST 184–85 (1996) (discussing the impacts and extent of conversion to agricultural and urban uses).

158 CHARLES S. COTTON ET AL., U.S. GEN. ACCOUNTING OFFICE, GAO/RCED-98-220, OREGON WATERSHEDS: MANY ACTIVITIES CONTRIBUTE TO INCREASED TURBIDITY DURING LARGE STORMS 19 (1998), *available at* www.gao.gov/archive/1998/rc98220.pdf.

159 Tarlock, *supra* note 2, at 154 (discussing the rebirth of integrated watershed management).

Fe, New Mexico certainly benefit the environment generally, but these investments benefit the thirsty residents of Santa Fe in a very particular way.[160] As such, the task of formulating a regulatory regime to implement watershed planning and management principles must consider the roles, perspectives, and existing capacities and local governments.[161]

1. Familiar Ground: Land-Use Regulations

An important observation to make about the local capacity to engage in watershed governance concerns the extent to which local governments will be able to adapt to the needs of watershed protection. A major shift in the political winds can be challenging, and as Professor Dan Tarlock explains, the project of effective watershed governance may require "no less than a reversal of our country's deeply entrenched" land-use patterns.[162] Tarlock explains that given the history of political and issue fragmentation of watersheds, local government might be required to invent new regulatory tools:

> The idea that the benefits of improving nature always exceed the costs is difficult to reverse because it is so deeply embedded in the law and philosophy of watershed use. We have been conditioned to appreciate the value of altered managed riverine landscapes. Historically, the flow of large river systems and their adjacent corridors have been perceived as under-used natural resources that should be extensively developed or used for waste disposal. Thus, rivers have often been conceptually and functionally "detached" from their surrounding landscape.[163]

By separating the regulation of water from landscapes, law has arguably incapacitated all governmental entities from effective watershed

160 Of course, the point here is not that there are no cross-boundary or global benefits to ecosystem services, but that there is a direct connection between ecosystem health investments and the well-being of the immediate beneficiaries at the community level.

161 In addition to the existing shortcomings of watershed regulation, the prospect of centralized control of watershed resources suffers intense political dilemmas. Local governments are already challenged by watershed fragmentation both geographically and by the resource-specific management structure of federal and state law. The more holistic approach taken in watershed management could raise concerns for local governments, at least because political boundaries have not adapted to reflect how watersheds are influenced. Omernik & Bailey, *supra* note 28, at 935 (noting that the focus on watersheds has resulted from an effort by governmental entities to "adopt more holistic approaches to research, assess, monitor, inventory, and manage their resources"). Asking local governments to take on responsibility for watershed investments that will benefit downstream users, without recourse or return, may be less than compelling. Demanding that local governments make such investments for others when there are few grounds for enforcing their own downstream interests may be too much to bear. For these reasons, centralized control of watershed management suffers probable problems of legitimacy. Ruhl et al., *supra* note 5, at 936 (noting that a "federal regulatory statute governing watershed management would [] risk failure to establish legitimacy at local levels").

162 A. Dan Tarlock, *Putting Rivers Back in the Landscape: The Revival of Watershed Management in the United States*, 14 HASTINGS W.-NW. J. ENVTL. L. & POL'Y 1059, 1063 (2008).

163 *Id.* (footnote omitted).

governance. Tarlock argues that a sea change is required to circumvent the limitations inhering in the reigning legal framework.[164] Of course, such radical changes are resisted.[165] However, it is possible that local governments do not suffer the threat of a legal upheaval. Indeed, local governments have familiarity with regulatory and governance tools that may be more adaptable to watershed needs.

Watershed plans often note that "the most effective and least costly way to protect water resources is during land use planning and siting."[166] It is easy to see why:

> 1) Outside of point source discharges, many if not most impacts to watershed functionality relate to use of land and its regulation, a historically local function;
>
> 2) Many of the individual services that local governments provide to their residents are substitutes for benefits that can be delivered, at least in part, by functioning watersheds, and as such, local governments have a sense of accountability not felt at other levels of government;
>
> 3) Inventorying ecosystem conditions and processes cannot be completed without some reliance on local knowledge and understanding of local prioritization; and
>
> 4) The analysis of tradeoffs among conservation priorities is more realistic and complete at the local level because of the tensions that local governments face.[167]

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164 *See id.* 1063–64.

165 *See, e.g.*, Minn. Co. v. Nat'l Co., 70 U.S. (3 Wall.) 332, 334 (1865) ("Where questions arise which affect titles to land it is of great importance to the public that when they are once decided they should no longer be considered open. Such decisions become rules of property, and many titles may be injuriously affected by their change.").

166 WENCK ASSOCS., INC., MINNEHAHA CREEK WATERSHED DISTRICT COMPREHENSIVE WATER RESOURCES MANAGEMENT PLAN: 2007–2017, at 101 (2007), *available at* http://www.pca.state.mn.us/index.php/view-document.html?gid=13458; *see also* BILL FROST ET AL., SEVERN RIVER: WATERSHED MANAGEMENT MASTER PLAN: FINAL REPORT, at ES-9 (2006), *available at* http://www.aacounty.org/DPW/Watershed/Severn_Final_Report_2-2006.pdf (finding that the most cost-effective pollutant removal strategy was continuation of stormwater control and other land-use regulations); CTR. FOR WATERSHED PROT., *supra* note 61, at 2.3 ("[W]atershed planning ranks as perhaps the single most important watershed protection tool."); Tarlock, *supra* note 2, at 152 ("Watershed management is ultimately land use management, and thus local governments have a potentially large role to play as the primary public stewards of the nation's private land base.").

167 Tony Arnold has identified 10 opportunities in which land-use regulation can act as an effective mechanism to conserve ecosystem services:

> 1. Land use affects ecosystems;
>
> 2. Many impairments to ecosystem services adversely affect land use;
>
> 3. The land use regulatory system increasingly protects the social, psychological, and political services that ecosystems provide to local communities, as well as traditionally economic services;
>
> 4. The ecosystem services concept is an anthropocentric valuation process for which the land use regulatory system can offer market alternatives and alternative markets;

Local governments that engage in planning and zoning are regularly engaging in the types of analysis that watershed planning requires: inventory of natural and built assets, assessment of the highest and best uses of each parcel both for individual and public needs, recognition of the impacts that land uses have in certain locations, identification of areas in which certain land uses should be valued more highly based on the locality's priorities, and design of an area so that land uses complement one another as envisioned for the locality's present and future.[168] As such, the advantages of enabling local governments to engage effective watershed protection coincide with the manner in which watershed functions serve local needs and governmental functions.

In early zoning enabling legislation, such as statutes modeled after the Standard State Zoning Enabling Act (SZEA),[169] local governments were authorized to establish districts "to lessen congestion in the streets," "to provide adequate light," and "to avoid undue concentration of population,"[170] factors that can have significant impacts on watershed functionality when not properly managed. More importantly, the SZEA also allowed local governments to design communities by "encouraging the most appropriate use of land throughout [the] municipality."[171] The SZEA was intended to allow local governments to design neighborhoods and communities and to

5. The land use regulatory system can help to develop an ecosystem-regarding psychology and ethic of place in communities;

6. Information about the impacts of land use activities on ecosystems is increasingly better and more readily available;

7. The land use regulatory system's environmental impact assessment process can create demand for information about the relationships between land use and ecosystem services;

8. Site-specific and project-specific discretionary decisions can tailor land use activities to protect ecosystem services in context while accommodating land use and other social goals;

9. The land use regulatory system offers the potential for innovation, experimentation, and adaptive functionality; and

10. The land use regulatory system is a mediating system, which is necessary for better values and choices.

Craig Anthony (Tony) Arnold, *The Structure of the Land Use Regulatory System in the United States*, 22 J. LAND USE & ENVTL. L. 441, 512–13 (2007).

168 *See id.* at 497, 500, 503, 519–21 (describing the factors local governments assess in land-use planning); *see also* ADVISORY COMM. ON ZONING, DEP'T OF COMMERCE, A STANDARD STATE ZONING ENABLING ACT: UNDER WHICH MUNICIPALITIES MAY ADOPT ZONING REGULATIONS 6–7 (rev. 1926) (dictating, in section 3, for local governments to make land-use regulations with consideration "to the character of the district and its peculiar suitability for particular uses, and with a view to conserving the value of buildings and encouraging the most appropriate use of land throughout such municipality" (footnotes omitted)).

169 *See generally* ADVISORY COMM. ON ZONING, *supra* note 168.

170 *Id.* at 6; *see* Ruth Knack et al., Commentary, *The Real Story Behind the Standard Planning and Zoning Acts of the 1920s*, LAND USE L., Feb. 1996, at 3, 3, *available at* http://www.planning.org/growingsmart/pdf/LULZDFeb96.pdf.

171 ADVISORY COMM. ON ZONING, *supra* note 168, at 7.

distribute benefits throughout the community.[172] As the Association of State Wetland Managers notes:

> Identification and analysis of wetlands and related ecosystems as part of broader watershed information gathering and analysis can not only identify natural functions and values relevant to suitable and appropriate use but determine natural hazards (e.g., flooding), property ownership, the costs of public services and other features also relevant to the most appropriate and suitable use of wetlands and other lands and waters.[173]

Some local governments have taken on the task of preserving watershed functions through the creative and innovative use of traditional tools such as height and bulk regulations and use zoning.[174] Of course, in many cases such innovations have come at the command of state or federal agencies. For instance, Washington's critical areas planning mandate has required local governments to consider and implement plans to ensure the protection of aquifers, habitat, wetlands, and steep slopes. In some areas, uncertainty over future water supplies has compelled local governments to integrate water supply planning into land-use plans.[175] What is important about these innovations is that there seems to be nothing foreign to governance in the local formulation of such protections.

Moreover, local governments have illustrated innovation in integrating innovative land-use control mechanisms into their local regulations. For instance, local governments have experimented with transferable development rights to incentivize development at a lower intensity than otherwise possible and to respond to ecosystem and other public welfare needs at a particular location.[176] Neighborhood design may benefit from cluster zoning and planned unit developments, which offer flexibility to local governments in accommodating natural features of a given site.[177] Planning ingenuities for built infrastructure such as urban growth boundaries can work equally well in planning for the protection of natural capital.[178] Finally, local governments have incorporated ecosystem services' needs and

172 *See* Chad D. Emerson, *Making Main Street Legal Again: The SmartCode Solution to Sprawl*, 71 MO. L. REV. 637, 652–54 (2006); Knack et al., *supra* note 170, at 3.

173 JOHN KUSLER, COMMON QUESTIONS: ESTABLISHING LOCAL GOVERNMENT WETLANDS AND WATERSHED MANAGEMENT PROGRAMS 2 (2006), *available at* http://aswm.org/pdf_lib/3_watershed_6_26_06.pdf.

174 *See, e.g.*, JOHN R. NOLON, OPEN GROUND: EFFECTIVE LOCAL STRATEGIES FOR PROTECTING NATURAL RESOURCES 55–60 (2003).

175 Tarlock, *supra* note 2, at 168.

176 *See id.* at 174.

177 Daniel R. Mandelker, *Legislation for Planned Unit Developments and Master-Planned Communities*, 40 URB. LAW. 419, 421–22, 431 (2008).

178 *See* Franklin & Halsey, *supra* note 52, at 11 (discussing ways in which an "[urban growth boundary] could guide development away from core populations of threatened species or areas with a particular density of native biodiversity such as Oregon's upland prairies").

inventories into comprehensive land-use plans to ensure that existing and new development does not impair ecosystem functions.[179]

Local regulation of land use illustrates that even if the land-use regulatory process has retained some of the fragmented approach seen in federal and state environmental laws,[180] it is not *fatally* fragmented; in local review processes, land uses are regulated for a broad range of watershed impacts.[181] Take, for instance, aquifer protection in local government regulations. Aquifers are responsible for providing safe drinking water for millions throughout the nation, and also are relied on for commercial and

179 Montgomery County, Maryland, has adopted an overlay zoning district to protect Upper Paint Branch Watershed and its headwater tributaries. MONTGOMERY CNTY., MD., ZONING ORDINANCE CODE § 59-C-18.151(a) (2010), *available at* http://www.amlegal.com/nxt/gateway.dll/Maryland/montzon/chapter59zoningnote?f=templates$fn=default.htm$3.0$vid=amlegal:montgomeryco_md_mc$anc=JD_59-C-18.15. The overlay zone intends to regulate erosion, maintain groundwater levels and temperature, protect biodiversity, and regulate water quality and quantity. *Id.* § 59-C-18.151.

180 Craig Anthony (Tony) Arnold, *Clean-Water Land Use: Connecting Scale and Function*, 23 PACE ENVTL. L. REV. 291, 302–03 (2006) (discussing local law fragmentation).

181 The direct benefit of land-use review is the elimination of a fragmented body of regulations that may be inconsistent or conflicting, and replacement with a code of regulations that can be used more efficiently in planning and more effectively in revealing impacts that may be invisible in sole-resource regulatory review. Hence, in the federal scheme, a proposal to pave a driveway is considered benign and will trigger few, if any regulatory requirements—unless, perhaps, if an uncommonly wide driveway either bisected a wetland that was known to serve as critical habitat for a listed species or traversed and disrupted a hazardous waste site. *See* Craig Anthony (Tony) Arnold, *Introduction: Integrating Water Controls and Land Use Controls: New Ideas and Old Obstacles*, *in* WET GROWTH: SHOULD WATER LAW CONTROL LAND USE? 1, 37–44 (Craig Anthony (Tony) Arnold ed., 2005) (discussing the authority of federal, state, and local governments to regulate land use, water use, and water quality). At the local level, however, a driveway is simply another use of land that may impose upon any of a variety of characteristics in the natural or built environment and can be regulated accordingly. At the local level, a driveway is benign only if it is determined to be benign when set against the baseline needs of the affected community. *See supra* text accompanying notes 169–72 (explaining the values considered in developing local zoning regulations). Even a driveway can be reviewed for its placement, size, constituents, and function, and may be conditioned to minimize or mitigate impacts to wildlife, riparian or aquatic health, aquifer recharge, aesthetics, or traffic circulation. This approach is expanding. Local governments are now consolidating their development regulations into Unified Development Ordinances (UDOs). *See, e.g.*, DURHAM, N.C., UNIFIED DEVELOPMENT ORDINANCE art. 1 (2006), *available at* http://www.durhamnc.gov/departments/planning/udo/ (click on "UDO Article 01 General"). UDOs are used as a tool to simplify zoning codes and make them more accessible to those governed by them by creating a unified system of development regulations. NICOLOSI & ASSOCS., LLC & CAMIROS, UNIFIED DEVELOPMENT ORDINANCE: A CASE STUDY FOR WINNEBAGO COUNTY 6 (2007), *available at* http://municipalconsultant.com/uploads/UDO%20White%20Paper%20-%20FINAL.pdf. A local government creating a UDO combines the various land-use regulations—subdivision codes, zoning codes, and other relevant development regulations—under a single cover to create a unified system of development regulations for a municipality. *Id.* In addition to the convenience of administering a consolidated ordinance, UDOs ensure a holistic review of land-use applications and enforcement of environmental restrictions through the coordination of approaches and regulatory focal points. *See, e.g.*, DURHAM, N.C., UNIFIED DEVELOPMENT ORDINANCE art. 8 (2006), *available at* http://www.durhamnc.gov/departments/planning/udo/ (click on "UDO Article 08 Environmental Protection").

industrial purposes and for replenishing surface water flows.[182] Land development has potential to affect groundwater not just through creating a greater volumetric need, but also by causing the long-term depletion of groundwater supplies through overdraft, contamination of groundwater by the addition of pollutants, and interference with aquifer recharge by creating impervious surfaces.[183] Local governments regulate the manner in which land uses impact groundwater to ensure sufficient water supplies for domestic uses and economic development.[184] In addition, groundwater protections are designed to protect drinking water sources through regulation of contaminant discharges and prevention of pollution.[185]

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182 About 35% of the United States' population—equating to more than 100 million people—get their drinking water from public groundwater systems that draw from aquifers. U.S. Geological Survey, *Understanding Contaminant Occurrence in Public-Supply Wells*, http://oh.water.usgs.gov/tanc/NAWQATANC.htm (last visited Feb. 18, 2012); *see also* SUBCOMM. ON WATER AVAILABILITY & QUALITY, EXEC. OFFICE OF THE PRESIDENT, SCIENCE AND TECHNOLOGY TO SUPPORT FRESH WATER AVAILABILITY IN THE UNITED STATES 5 (2004), *available at* http://water.usgs.gov/owq/swaq.pdf (noting that the agricultural and energy sectors are the two largest consumers of water in the United States today, despite efficiency innovations over the past several decades, as well as substantial reductions in the amount of water used per kilowatt-hour by power generators); *see generally* Thomas C. Winter, *Relation of Streams, Lakes, and Wetlands to Groundwater Flow Systems*, 7 HYDROGEOLOGY J. 28 (1999), *available at* http://www.springerlink.com/content/9d3v9x1522f6wbg2/fulltext.pdf (discussing various ways groundwater can affect surface water flows, depending on topography, geography, climate, and physical qualities of the soil that create an aquifer's boundaries).

183 Dan Tarlock observes that water quality and quantity lie at the heart of local governments' control over land uses:

> Many states face the following dilemma: rapid urban growth is placing new stresses on the ability (or perceived ability) of water supplies to support this growth. These stresses are occurring at a time when no coherent federal supply and management water policy exists to mediate conflicts among uses, and states have been slow to fill the vacuum. Today, growing cities compete with proponents of aquatic ecosystem restoration and other traditional users.

A. Dan Tarlock, *We Are All Water Lawyers Now: Water Law's Potential But Limited Impact on Urban Growth Management*, *in* WET GROWTH: SHOULD WATER LAW CONTROL LAND USE?, *supra* note 181, at 57, 60, 65–66.

184 Although federal and state laws protecting specific resources—such as wetlands—or establishing regional planning goals have increasingly asserted authority over land use, local governments retain primary responsibility for land-use regulation. Arnold, *supra* note 181, at 37–38. Cities have used various land-use controls—such as residential construction caps, moratoria, and growth boundaries, as well as offering incentives to construction companies to provide amenities to development projects—as ways to match a city's growth to its water service capacity. A. Dan Tarlock, *How California Local Governments Became Both Water Suppliers and Planners*, 4 GOLDEN GATE U. ENVTL. L.J. 7, 20 (2010).

185 Weston, Wisconsin has adopted a zoning ordinance that is "intended to protect from contamination the groundwater recharge zone of the village's existing and planned municipal groundwater wells, which wells supply the potable water to the village's many residential, business, institutional and other utility customers. This district is necessary because the water utility by geological necessity must draw its water from the ground levels lying closest to the surface, which grounds contain soil types that rapidly transmit pollutants, thereby threatening the entire groundwater supply being drawn upon by the municipal wellhead." WESTON, WIS., ZONING ORDINANCES ch. 94, art. XI, § 94.198(a) (1991), *available at* http://westonwisconsin.org/planning/zoning.php. Because of the variety of ways that groundwater is captured, groundwater

What is significant is that local regulation of watershed characteristics applies to a broad range of activities on the land, including but not limited to direct use of the aquifer structure or area.[186] In local laws, for example, wetlands may be protected by regulating the behaviors that directly or indirectly affect wetlands: local governments spend less time arguing about the definition of "dredge" or "fill," and more time contemplating the value of the tradeoff at issue.[187] Likewise, local protection of groundwater arises in several regulatory schemes, including the direct regulation of aquifer recharge,[188] but also in subdivision,[189] storm water and erosion control,[190] site

is typically subject to several overlapping regulatory regimes at the federal, state, and local level. Protections at the state and federal level may be applicable to well drilling and wellhead protection, discharge of pollutants, releases and remediation of hazardous wastes, design and operation of municipal and hazardous waste disposal sites, water allocation, and the acquisition of municipal water supplies. State laws may also identify particular aquifer protection areas and enlist the participation of local governments to aid in water quality protection.

186 With ecosystem services as a driver of local governance, the limitations created by political boundaries become less central as an obstruction because the ecosystem service approach attributes value to ecosystem function, instead of ecosystem location. *See* Keith H. Hirokawa, *Three Stories About Nature: Property, the Environment, and Ecosystem Services*, 62 MERCER L. REV. 541, 575, 593–601 & n.268, 602–03 (2011) (discussing the manner in which ecosystem services challenges the primacy of boundaries). One of the goals of connecting the interests of local governments to ecosystem services is to encourage local communities to recognize that they are the primary beneficiaries of nested ecosystem services, and that they should feel accountable for the protection and management of ecosystem processes. *See id.* at 580–83, 588. The argument goes that ecosystems are influenced in a codependent and reflective manner by community design, which, as a function of local governance, should commit to a perspective that values the continuing receipt of ecosystem services.

187 *See, e.g.*, Queach Corp. v. Inland Wetlands Comm'n of the Town of Branford, 779 A.2d 134, 140 & n.12, 150 (Conn. 2001) (upholding a wetland ordinance triggered by activities substantially diminishing inland wetland or watercourse capacities to support fisheries and wildlife, supply water, prevent flooding, process waste, facilitate drainage, or provide open recreational space).

188 Hernando County's groundwater protection ordinance is focused on the fact that the Floridan Aquifer underlying the County is unconfined and vulnerable to contamination. HERNANDO CNTY., FLA., GROUNDWATER PROTECTION AND SITING ORDINANCE 94-8 pmbl., § 2 (June 27, 1994), *available at* http://www.co.hernando.fl.us/utils/PDF/ordinances/Ordinance%2094-08.pdf ("It is the intent and purpose of this Ordinance to protect and maintain the quality of groundwater in Hernando County by providing criteria for land uses and the siting of facilities which use, handle, produce, store or dispose of Regulated Substances; and by providing protection to vulnerable features which discharge directly to the Floridan aquifer. This Ordinance, through its provisions, shall protect the quality of water obtained from existing and future community public supply wells described in this ordinance, in addition to the County-wide groundwater resources.").

189 State Dep't of Ecology v. Campbell & Gwinn, L.L.C., 43 P.3d 4, 10–13 (Wash. 2002) (finding that statutory exemptions from the groundwater permitting system for domestic wells was not applicable to applications to subdivide, recognizing that the exemption was not intended to exempt a water use of so many users).

190 N.J. ADMIN. CODE § 7:8-2.2 (2011) explicitly includes erosion control, as well as prevention of pollution and assurance of groundwater recharge as goals of stormwater management regulation and permitting process.

design,[191] and wetlands programs.[192] Zoning ordinances that explicitly address protections often establish overlay districts or other mechanisms to focus on groundwater quality.[193] Aquifer Protection Overlay Zones often expressly identify particular land uses as prohibited, permitted, or conditional uses.[194] Groundwater programs may distinguish between agricultural uses and needs for growth and development,[195] *and local governments that include groundwater supplies in the comprehensive planning process often coordinate such planning with the adoption of water conservation standards.*[196] These local programs illustrate the degree of commitment and local intellectual capital that are available to watershed protection.[197]

191 DARTMOUTH, MASS., ZONING BYLAWS § 20.701(d) (2008) ("Site design shall incorporate natural drainage patterns and vegetation in order to maintain pre-development stormwater patterns and water quality to the greatest extent feasible.").

192 In Westport, Connecticut, wetlands are recognized as important, among other things, for "recharging and purification of groundwater," and as such, regulations that address wetlands development impact groundwater quality. WESTPORT, CONN., WETLANDS AND WATERCOURSES REGULATIONS § 1.3 (2004), *available at* http://www.westportct.gov/modules/showdocument.aspx?documentid=795.

193 *See* Robert J. Blackwell, *Overylay Zoning, Performance Standards, and Environmental Protection After* Nollan, 16 B.C. ENVTL. AFF. L. REV. 615, 629, 632–34 & n.152 (1989).

194 Vermont developed a model ordinance to enable municipalities to incorporate Groundwater Protection Overlay Districts (GPOD) into existing local zoning bylaws. *See* VT. MODEL GROUNDWATER PROT. ORDINANCE § B (n.d.), *available at* http://www.vermontdrinkingwater.org/GWPRS/GroundwaterProtectionModelOrdance.doc. The establishment of a GPOD provides for two different zones: 1) a "Drinking Water Critical Impact Zone" that includes parcels within a "two-year time-of-travel" determined by permeability and slope, and 2) a "Drinking Water Potential Impact Zone" to include those parcels not within the Drinking Water Critical Impact Zone, but still considered important for drinking water protection. *Id.* § E(1)–(2). An ordinance passed in Hernando County, Florida, establishes two community "Wellhead Protection Areas," as well as delineates special protection areas with explicitly prohibited uses in each area. HERNANDO CNTY., FLA., ORDINANCE 94-8 §§ 5(A), 6(A)–(B) (1994), *available at* http://www.co.hernando.fl.us/utils/PDF/ordinances/Ordinance%2094-08.pdf. The aquifer protection zone in Stratham, New Hampshire, establishes minimum lot sizes and restricts impervious surfaces to 20% of the lot unless a stormwater drainage plan that provides for removal of oil and gasoline from parking lot runoff is developed and approved. STRATHAM, N.H., ZONING ORDINANCE § 13.4(a)–(c) (2011), *available at* http://www.epa.gov/owow/NPS/ordinance/documents/stratham_nh.pdf. The Stratham ordinance also identifies specific prohibited and conditional uses in the zone. *Id.* § (C)–(D). GPODs often identify uses deemed allowable as primary or accessory uses and strictly prohibit certain land uses based on their potential to contaminate groundwaters. Other ordinances may regulate the storage of potential contaminants, automobile service stations, manufacturing facilities, landfills, mining sites, septic systems on lots smaller than 40,000 square feet, among others. *See, e.g.*, WESTON, WIS., ZONING ORDINANCE ch. 94, art. 11, § 94.198 (1991), *available at* http://westonwisconsin.org/media/94art11DistrictRegs.pdf.

195 Agricultural groundwater regulations by state and federal agencies may require additional permitting for the prevention of groundwater contamination when pesticides and chemicals are used. *See, e.g.*, MICHAEL T. OLEXA ET AL., HANDBOOK OF FLORIDA WATER REGULATION: GROUNDWATER DISCHARGE REGULATIONS AT THE STATE LEVEL (2009), *available at* http://edis.ifas.ufl.edu/pdffiles/FE/FE60100.pdf. Florida requires that irrigation systems used for pesticide application include an antisiphon device to prevent water contamination. FLA. STAT. ANN. § 487.064(1) (West 2006).

196 For instance, Broward County, Florida recently amended its comprehensive plan to include groundwater recharge. The amendments provide:

What distinguishes the local regulation of groundwater interference and use is recognition of the relevance of *local* circumstances, including geological conditions, sources of private and public water supplies, existing and future water demands, and competing land uses, among others. For instance, Salt Lake City, Utah recognizes the importance of groundwater protection to the public water supply in its Groundwater Source Protection Overlay District.[198] Weston, Wisconsin adopted a wellhead protection overlay district that was made "necessary because the water utility by geological necessity must draw its water from the ground levels lying closest to the surface, which grounds contain soil types that rapidly transmit pollutants,

> Objective 7.5. Maintain and enhance ground water recharge to the surficial aquifer system so as to maintain all of the functions of the Biscayne Aquifer, including potable water supply, the abatement of saltwater intrusion, and reduced seepage from the Water Conservation Areas, while ensuring the necessary water quality protections.

BROWARD CNTY., FLA., ORDINANCE 2008-41, § 7.5 (Sept. 9, 2008), *available at* http://www.broward.org/PlanningAndRedevelopment/ComprehensivePlanning/Documents/drainageandnatural.pdf. The objective is supported by several policies that include the protection of aquifers by encouraging conservation measures in water use. *Id.* § 7.5.13. Critical water resources that are identified through municipal planning processes are likely to be upheld as a legitimate exercise of the police power. *See, e.g.*, Pio Costa Enters. v. Twp. of Montville, No. MRS-L-936-03, 2007 WL 6140173 (N.J. Super. Ct. Law Div. Apr. 16, 2007). In that case, a developer owning 400 acres filed suit alleging arbitrary and capricious inclusion in critical water resources district because the property was not included in 1996 or 1998 studies identifying the legislatively protected zoning, but was included following the developer's application. Trial Memorandum on Behalf of Plaintiff Pio Costa Enterprises at 2, 4, 6–10, *Pio Costa Enters.*, No. MRS-L-936-03, 2006 WL 6212163 (N.J. Super. Ct. Law Div. Sept. 25, 2006). The court issued an order upholding the municipal ordinance designating the property as a critical water resource within the 'Prime Aquifer/Aquifer Proper,' and dismissing the developer's complaints. Brief for Defendant, Township of Mountville at 19, *Pio Costa Enters.*, No. MRS-L-936-03, 2006 WL 6212162 (N.J. Super. Ct. Law Div. Oct. 30, 2006) (quoting disputed ordinance); *see also Pio Costa Enters.*, No. MRS-L-936-03, 2007 WL 6140173 (upholding ordinance under arbitrary and capricious review).

197 To meet its storm water runoff challenges, Pulaski County, Arkansas, has adopted performance standards and conservation standards that are applicable within the watersheds of designated public water supply reservoirs. PULASKI CNTY. PLANNING & DEV., SITE EVALUATION TOOL USER GUIDANCE AND DOCUMENTATION FOR THE LAKE MAUMELLE DRAINAGE BASIN, PULASKI COUNTY, ARKANSAS 1, 3 (rev. 2010), *available at* http://co.pulaski.ar.us/pdf/SETUserGuidanceV14.pdf.

198 The Salt Lake Ordinance provides as follows:

> The purpose of this section is to protect, preserve, and maintain existing and potential public drinking groundwater sources in order to safeguard the public health, safety and welfare of customers and other users of the city's public drinking water supply, distribution and delivery system. The intent of this section is to establish and designate drinking water source protection zones and groundwater recharge areas for all underground sources of public drinking water which enter the city's culinary drinking water supply, distribution and delivery system, whether such sources are located within, or outside of, the city's corporate boundaries.

SALT LAKE CITY, UTAH, CODE § 21A.34.060(B) (2009), *available at* http://www.slcgov.com/government/code1009.pdf.

thereby threatening the entire groundwater supply being drawn upon by the municipal wellhead."[199]

2. Modeling Utilities to Maximize Watershed Investments

Unfortunately, a list of the top ten drivers for natural capital protection accruing in watersheds is not likely to include some formulation of legal responsibility. We might find several ecosystem-based candidates, several candidates related to local character and community, and perhaps even an appeal to the needs of future generations. We are certain to find legal duties related to particular ecosystem benefits, such as the provision of safe drinking water, containment of hazardous substances releases, or maintenance of critical habitat for listed endangered species.[200] However, there is little express legal structure to support explicit legal duties to protect natural capital in watersheds.[201]

On the other hand, local governments are in the business of creating and maintaining communities—an honor that implies duties to determine whether land uses fit, where they fit, and how that fit will be supported by the provision of public needs and benefits through an adequate and efficient infrastructure. Arguably, all progress in land-use controls has derived from the promise that these three are interdependent components.[202] In some ways, the infrastructure component of community building provides the foundation for sound land-use decision making, if only because an inadequate infrastructure inevitably impairs the range of feasible present and potential uses of land due to a lack of needed services.[203] Yet, even when

199 WESTON, WIS., ZONING ORDINANCES ch. 94, art. 11, § 94.198(a) (1991), *available at* http://westonwisconsin.org/media/94art11DistrictRegs.pdf.

200 *See* Safe Drinking Water Act, 42 U.S.C. §§ 300f to 300j-26 (2006); Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. §§ 9601–9675 (2006); Endangered Species Act of 1973, 16 U.S.C. §§ 1531–1544 (2006 & Supp. IV 2010).

201 There are areas that suggest fiduciary duties to the public in the management of natural resources. *See, e.g.*, Wood, *supra* note 7, at 139 (arguing for governmental obligation to preserve natural resources as trustee). Municipalities have an affirmative duty to provide infrastructure to their citizens generally, even if they are afforded wide discretion regarding the manner of providing such infrastructure. 11 EUGENE MCQUILLIN, THE LAW OF MUNICIPAL CORPORATIONS § 31:12 (3d ed., rev. vol. 2010); *see, e.g.*, Charles v. Diamond, 360 N.E.2d 1295, 1299, 1301 (N.Y. 1977) (stating that village is not bound to furnish sewer structure to particular property owner when the cost of such service would be prohibitive to the village as a whole, but the village cannot exclude one property unconstitutionally). On the other hand, municipalities do not generally have a duty to provide water or sewer to nonresidents. *See* Rehm v. City of Batavia, 125 N.E.2d 831, 834 (Ill. App. Ct. 1955) (stating that absent a contractual obligation, a city is under no duty to furnish water supply to nonresidents); Schroeder v. City of Grayville, 520 N.E.2d 1032, 1034 (Ill. App. Ct. 1988) (stating that city has no duty to provide infrastructure where there is no contract so long as the decision is not discriminatory). Nevertheless, states have in many cases authorized wide latitude to local water districts as a means of institutionalizing self-determination in water policy. *See, e.g.*, Callagy, *supra* note 62, at 247 (recognizing that "[d]evolution of authority to limited local governments, an intrastate federalism, reflects a policy favoring local self-determination in finding appropriate solutions").

202 James A. Kushner, *Smart Growth: Urban Growth Management and Land-Use Regulation Law in America*, 32 URB. LAW. 211, 233, 237–38 (2000).

203 *See id.* at 237–38.

local governments have busied themselves with the provision of services, their focus has been "primarily on the provision of services through modification of the landscape or construction of specialized facilities—that is, through 'built structures.'"[204]

The ecosystem services approach improves local governance capacity by changing the methodology by which we judge accountability. Municipal investments in public services can be held to public accountability, as the ecosystem services valuation allows us to "compare natural infrastructure solutions side by side with built infrastructure."[205] The water utility perspective is particularly illuminating due to the advantages of thinking about water provision as an infrastructure issue. Water provision has historically been a local service and a responsibility that has resulted in a complex physical and financial infrastructure for the capture, treatment, and transportation of water and sewerage.[206] Water utilities are cost-conscious and, for the most part, accountable, both to their customers and to political leaders.[207]

An important sign of progress in this context is the ongoing redefinition of "water infrastructure" to include green infrastructure and naturally occurring watershed functions.[208] At the Aspen Institute, participants called for "a clear understanding of the interdependence of the natural environment that produces clean water with the built infrastructure that manages, delivers and treats water."[209] A multistakeholder dialogue produced consensus on recommendations aimed at surviving the imminent infrastructure needs that began with a fundamental premise:

> The traditional 19th and 20th century definition of water infrastructure focused mainly on physical structures associated with drinking water supply and distribution, and collection and disposal of wastewater and stormwater. The participants of the Aspen Dialogue suggest that this definition, which stops at a pipe's end, is too narrow. The 21st century definition of sustainable water infrastructure includes the traditional man-made or built infrastructure

204 Heal et al., *supra* note 5, at 334.

205 Judge-Lord & Cochran, *supra* note 92, at 11.

206 MONSMA ET AL., *supra* note 48, at 9 ("[W]e have built a complex water infrastructure to deliver potable water to homes and businesses, to carry away, treat and manage wastewater and stormwater, and to store water for future use. Alongside this water infrastructure has evolved an equally complex regulatory framework designed to monitor and ensure water quality. We have also established various financial mechanisms for the construction, maintenance, and development of our man-made (built) water infrastructure.").

207 The potential shortcomings of the water utility approach have been well explored. The outcome of this analysis has been a conceptual push away from a utility model, as noted by Dan Tarlock: "The law is moving from the classic public utility model of water supply duties, which dominated local water supply planning, to the integration of land and water planning and regulation." Tarlock, *supra* note 184, at 11. This does not mean that water utilities are irrelevant. Some state legislatures have expressly authorized watershed management districts to engage in *land-use* control regulation. *See, e.g.*, MINN. STAT. ANN. § 103D.345 (West 2009). At a minimum, however, it is recognized that watershed services involve land-use choices as well as water allocation policies.

208 MONSMA ET AL., *supra* note 48, at 10.

209 *Id.*

> components *and* the natural infrastructure, such as rivers, lakes, streams, groundwater aquifers, floodplains, floodways, wetlands, and the watersheds that serve or are affected by water and wastewater systems. A sustainable water infrastructure integrates the traditional components with the protection and restoration of natural systems, conservation and efficiency, reuse and reclamation, and the active incorporation of new decentralized technologies, green infrastructure and low impact development to ensure the long-term reliability and resilience of our water resources.[210]

Without including natural systems in the definition of water infrastructure, water systems and their managers will continue to misunderstand and miscalculate the impacts of overuse, misuse, runoff, and climate variability.

The trend toward characterizing and understanding nature as ecosystem services is both an addition to and replacement of past utility-driven characterizations. To the extent that ecosystem services research aims to attribute economic value to ecosystem benefits,[211] the approach fills a gap that has long plagued a dominant cost-benefit approach to environmental policy formulation. To the extent that ecosystem services focus on ecosystem processes and attribute value to the noncommodification of ecosystem goods and functions,[212] ecosystem services is quite new. From either perspective, however, the approach is important, as "[e]cosystem services provide a new platform for the old challenge of aligning conservation and development."[213]

Local governments have taken the initiative to secure ecosystem services by taking an interest in ecosystem processes themselves. For instance, the City of Seattle and Seattle Public Utilities (SPU) have acted to protect both the primary benefits of water provision and water quality accruing from the watershed, as well as other ecosystem services co-benefits, illustrating that the assessment of tradeoffs can often weigh heavily in favor of ecosystem restoration.[214]

Seattle is home to a complex system of urban watersheds that include Thornton Creek,[215] Piper's Creek,[216] Taylor Creek,[217] Longfellow Creek,[218] and

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210 *Id.*

211 *See supra* notes 15–18 and accompanying text.

212 *See supra* notes 25–27 and accompanying text.

213 Heather Tallis et al., *Integrating Conservation and Development in the Field: Implementing Ecosystem Service Projects*, 7 FRONTIERS IN ECOLOGY & ENV'T 12, 12 (2009).

214 In 2010, Earth Economics studied the operations of SPU and its role in providing water to the residents of greater Seattle. Although relevant, the specific question addressed in the report was not water quality. Rather, Earth Economics was charged with the task of analyzing the water quality advantages achieved by SPU's acquisition of watershed lands, management of ecosystem processes, and delivery of ecosystem cobenefits: "The question is how to manage more effectively the delivery of water and the intricately connected suite of other ecosystem services flowing off SPU lands." DAVID K. BATKER, EARTH ECON., WATER, ECOSYSTEM SERVICES AND OPPORTUNITIES FOR SEATTLE PUBLIC UTILITIES 11 (2010), *available at* http://www.eartheconomics.org/FileLibrary/file/Reports/Puget%20Sound%20and%20Watersheds/Earth%20Economics%20Study%20for%20Seattle%20Public%20Utilities.pdf.

215 The Thornton Creek watershed is highly urbanized, draining approximately 11 square miles and running northeast through Seattle. Seattle Pub. Utils., City of Seattle, *Our Watersheds*,

Fauntleroy Creek.[219] The vast majority of the City's water supply, however, is captured from watersheds outside of the City's boundaries.[220] The 90,638-acre, Seattle-owned Cedar River Municipal Watershed provides about seventy percent of the drinking water for the greater Seattle area residents.[221] The smaller Tolt River Watershed supplies about thirty percent of the drinking water for Seattle residents.[222]

The City of Seattle began to acquire interests in the Cedar River Watershed in 1899.[223] At that time, the watershed was actively logged, but not actively protected.[224] In 1924, Seattle changed the course of the Cedar River Watershed by retaining a staff forester and began reprioritizing the value placed on the watershed.[225] However, it was not until 1962 that the city successfully negotiated the Cedar River Watershed Cooperative Agreement with private parties for the eventual transfer of watershed lands to the city.[226] At present, Seattle enjoys substantial control over the ecosystem processes that regulate and provide water from the Tolt River Watershed.[227] Seattle currently owns approximately seventy percent of the Tolt River Watershed.[228]

http://www.seattle.gov/util/Services/Drainage_&_Sewer/Keep_Water_Safe_&_Clean/RestoreOurWaters/OurWatersheds/index.htm (last visited Feb. 18, 2012).

216 Piper's Creek drains almost three square miles in northwest Seattle. *Id.*

217 Taylor Creek is Seattle's fourth largest creek and flows into Lake Washington. *Id.*

218 Longfellow Creek drains a 2685-acre watershed into the Duwamish River. *Id.*

219 *Id.*

220 *See id.* (explaining that most of Seattle's freshwater supply comes from the surrounding Cedar River and Tolt watersheds).

221 Seattle Pub. Utils., City of Seattle, *Cedar River Watershed*, http://www.seattle.gov/util/About_SPU/Water_System/Water_Sources_&_Treatment/Cedar_River_Watershed/index.asp (last visited Feb. 18, 2012). In 1962, landowners signed the Cedar River Watershed Cooperative Agreement, which set up a process of land transfers that resulted in Seattle's complete ownership of its watershed lands. Seattle Pub. Utils., City of Seattle, *History of the Watershed*, http://www.cityofseattle.net/util/About_SPU/Water_System/Water_Sources_&_Treatment/Cedar_River_Watershed/HistoryoftheWatershed/index.htm (last visited Feb. 18, 2012). This led to further procedures for fire protection and public access control. *Id.* In 1996, the United States Department of Agriculture Forest Service ceded its watershed land to the City, which gave Seattle final and sole ownership of the entire watershed. *Id.*

222 Seattle Pub. Utils., City of Seattle, *Tolt River Watershed*, http://www.cityofseattle.net/util/About_SPU/Water_System/Water_Sources_&_Treatment/Tolt_River_Watershed/index.asp (last visited Feb. 18, 2012).

223 Seattle Pub. Utils., *History of the Watershed*, *supra* note 221.

224 *See id.*

225 *Id.*

226 *Id.*

227 *See* TETRA TECH, SOUTH FORK TOLT WATERSHED MANAGEMENT PLAN 1-1 to -4 (2011).

228 *Id.* at 2-1. The City first purchased water rights in the Tolt River drainage basin in 1936, but at that time the City did not have the rights or infrastructure for diversion, transmission, or distribution of the water. *Id.* at 2-2. When the City acquired property interests in 1959 to construct a reservoir, it concurrently acquired rights to enforce environmentally protective logging practices in the watershed to maintain water quality. *Id.* at 2-3. The City's acquisitions continued through 1997, when it acquired the remainder of Weyerhaeuser's property holdings in the Tolt River Watershed. *Id.* at 2-4.

The result of Seattle's persistence has been remarkable, and it is not surprising that the investment strategy serves as a model:[229]

> As it turned out, this was a magnificent investment by any measure. Today SPU would have to pay [an upfront cost of] $250 million to build a filtration plant to filter the city's water supply [with annual operating and maintenance costs of $3.6 million per year] if the forest did not do the job. In addition, by 2010 it would likely have been the third or fourth filtration plant to be built as filtration plants, like all built capital, depreciate and eventually fall apart. Like most natural capital, the forest did not depreciate or fall apart. Relative to the size of the asset, a forest requires light maintenance. The watershed now provides far more water and value than ever was imagined by the original SPU directors. An additional benefit reaped from this wise investment is that lives were saved as cholera, once a significant problem in Seattle, was eliminated through the development of a clean, reliable water supply.[230]

In the meantime, the City of Seattle has integrated its green infrastructure principles into its land use and open-space planning, resulting in substantial ecosystem service value benefits to Seattle city residents.[231] In some cases, therefore, particularly in those involving municipal-owned utilities, the utility model presents opportunities.

The primary advantages served by the creation of a watershed utility relate to both the valuation of ecosystem services and the correlative justification for investments in natural capital. As the utility calculates its costs—acquisition and management of natural and built capital—and benefits—additional built infrastructure avoided—and determines how to charge for the provision of the received benefits, the utility will likely attempt to maximize natural capital investments.[232] As suggested by Earth Economics, "[t]he District would invest to gain the greatest suite of public benefits. For example, it is likely that greater flood prevention could be gained with less cost by increasing wetlands and forest coverage, which also

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229 Other cities have taken similar measures. For instance, New York City recently acquired interests to 1655 acres of upstate land, at a price of approximately $4.4 million, as additions to the City's upstate watershed protection efforts. *NYC to Acquire 1,655 Acres of Land for Watershed Protection*, SUSTAINABLE CITY NETWORK, Aug. 16, 2011, http://www.sustainablecitynetwork.com/topic_channels/water/article_236dba8a-c875-11e0-873f-0019bb30f31a.html?utm_source=SCN+In Box+e-Newsletter&utm_campaign=b9c8a6198f-Newsletter_8-17-2011_Admin&utm_medium=email#.Tk0zuK3mED8.email (last visited Feb. 18, 2012). Since 1997, nearly 1400 landowners have agreed to sell ownership or easement interests to 120,000 acres of land in the Catskill/Delaware and Croton watershed systems. *Id.*

230 DAVID BATKER ET AL., VALUING THE PUGET SOUND BASIN: REVEALING OUR BEST INVESTMENTS 10–11 (2010); David Cosman et al., *How Water Utilities Can Spearhead Natural Capital Accounting*, 2 SOLUTIONS, Jan. 2012, at 28, 28, *available at* http://www.thesolutionsjournal.org/node/1018.

231 *See* TRUST FOR PUB. LAND, THE ECONOMIC BENEFITS OF SEATTLE'S PARK AND RECREATION SYSTEM 4 (2011), *available at* http://cloud.tpl.org/pubs/ccpe-seattle-park-benefits-report.pdf ("The park system of Seattle thus has provided the city with annual revenue of $19.2 million, a municipal cost savings of $12.4 million, a resident savings of $511.6 million, and a collective increase of resident wealth of $110.8 million.").

232 *See* BATKER, *supra* note 214, at 29.

assists with carbon sequestration, salmon restoration, groundwater recharging and drinking water provisioning."[233]

3. Increasing Capacity Through Collaborative Governance

It is not particularly surprising that the challenge of scale in watershed governance confronts different entities in different ways. For a federal agency, watershed boundaries may be complex for purposes of preserving governance legitimacy: watershed boundaries typically are inclusive of several state, regional, and local jurisdictions, whose interests and positions relative to water flow have the potential to create competition to allocate both the various burdens necessary to maintain watershed functionality and benefits of watershed services.[234] It has been argued, and in places it may have proven accurate, that the competition among such situated local governments can cause gridlock.[235] For local governments, the boundedness of municipal authority relative to the geographical location of a given watershed may compel communities to withdraw from watershed protection if they feel their efforts are not being reciprocated or where watershed functions are controlled by other jurisdictions.[236]

In theory, governing according to watershed boundaries is ecologically sound: "[E]cosystem services provided in a watershed tend to conform to natural boundaries . . . at least more consistently than by ecologically arbitrary jurisdictions."[237] Assuming ecosystem value is most effectively and efficiently captured through functioning ecosystem processes, governance at a watershed scale insures the incorporation of ecosystem considerations into a wide range of policies and decisions that have direct and indirect impacts on ecosystem functionality. Allowing political boundaries to fragment this consideration risks more than just interjurisdictional competition and conflict: "For too long, water quality management has been characterized by compartmentalization and the creation of artificial boundaries among and between various aspects of what should be a unified approach to water quality in terms of the chemical, physical, and biological integrity of the nation's waters."[238]

233 *Id.* at 31.

234 *See* Echeverria, *supra* note 62, at 568–70 (stating that the Department of the Interior delegated authority to the states covered by the watershed to incorporate water users in the Platte Basin but at least two of the states had competing interests that stymied the project).

235 *Id.* at 579–80. In contrast, Jonathan Rosenbloom argues, "The failure to reach consensus is not necessarily indicative of a failure of motivation to reach consensus, but rather it is a testimony to the hurdles facing higher levels of government when seeking to regulate [common pool resources]." Rosenbloom, *supra* note 56, at 38.

236 *See* Ruhl et al., *supra* note 5, at 937 ("[M]anagement of transboundary effects often lies outside [local government's] authority or is able to be undertaken only through burdensome interlocal coordination procedures.").

237 BATKER, *supra* note 214, at 29.

238 Mehan, *supra* note 52, at 14.

Watershed partnerships, which have been recognized at the state and regional level for some time,[239] enable the participants to share goals and participate in mutually beneficial consequences of concerted action.[240] Partnerships can be responsive to the particular circumstances of a given watershed, as they "can build on local knowledge and craft specialized policies congruent with local watershed problems."[241] Moreover, collaborative models in watershed governance have proven effective in breaching intractability between competing interests,[242] establishing a process for information sharing, and rallying neighboring jurisdictions to cumulative goals.[243]

At the base, however, of the focus on partnerships and collaborations is a fear that local governments cannot take on the task of watershed management alone. Local governments are frequently chilled by threats of—and uncertainty surrounding—the "takings" challenge.[244] Local governments generally exercise little or no direct control over water quality, and even if they did, such authority might be exercised, as it traditionally has, to secure water for future growth.[245] Of course, local governments typically cannot compel their neighbors to plan, and as such, it has been recognized that the

239 *See* Lubell et al., *supra* note 8, at 159 ("The disillusionment with state and federal alternatives among both environmental and economic interests has provided a niche for the emergence of decentralized institutions that encourage cooperation among divergent interests.").

240 In North Carolina, the Ecosystem Enhancement Program (EEP) has been designed to initiate collaborative watershed partnerships. This state- and federal-led effort recognizes the critical importance of local priorities and stakeholder involvement. In the EEP's study of the "key interests" in the Morgan and Little Creeks drainage area:

> [T]he term "interest" refers primarily to what key activities or resources are being utilized by local stakeholders within the watershed area (i.e., agricultural, economic growth, municipal and county, recreational, and academic interests all have representation within the watershed and therefore an interest in how the watershed currently functions). Because local residents have specific historical and current knowledge about a watershed, they are vital to the planning process.

ECOSYSTEM ENHANCEMENT PROGRAM, MORGAN AND LITTLE CREEKS LOCAL WATERSHED PLAN: SUMMARY 8 (2004), *available at* http://www.nceep.net/services/lwps/Morgan_Creek/Morgan-LittleCreekSummaryFINALsaved.pdf. On the other hand, cooperation does not always guarantee success. *See, e.g.*, U.S. ENVTL. PROT. AGENCY, OKLAHOMA: CITY OF TULSA: CITY OF TULSA'S COMPREHENSIVE WATERSHED MANAGEMENT APPROACH (2010), *available at* http://water.epa.gov/infrastructure/drinkingwater/sourcewater/protection/casestudies/upload/Source-Water-Case-Study-OK-Tulsa.pdf (discussing the Tulsa's decision to take legal action when the cooperative process was failing).

241 Lubell et al., *supra* note 8, at 149.

242 *See id.* at 149–50 (arguing that watershed partnerships can overcome gridlocks and inefficiencies in mutually beneficial ways); *see also* ELINOR OSTROM, GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION 30–33 (1990) (defining "common-pool resources" and explaining the connection of interests in the use and management of them).

243 *See* Jamison E. Colburn, *Localism's Ecology: Protecting and Restoring Habitat in the Suburban Nation*, 33 ECOLOGY L.Q. 945, 1007 (2006) (discussing the potential of inter-local partnerships to create habitat networks).

244 *See* Tarlock, *supra* note 2, at 169–72 (discussing the problems of courts' takings jurisprudence on watershed and biodiversity protection).

245 *Id.* at 165–66.

geographical and practical constraints of political entities compel both vertical and horizontal collaboration.[246]

For purposes of this Article, it is relevant to see that models of collaborative governance may improve the ability of local governments to protect their interests on a watershed scale. However, it is critically important to note that collaborative watershed governance can be an effective capacity-builder for local governments when focused on maximizing watershed services. From this perspective, watershed governance concerns the alignment of watershed goals and coordination of the process of land-use prioritization across community boundaries. Collaborative management of common pool resources may even encourage greater participation of local governments as a means to preserve local autonomy: "When members have the authority to make rules, to monitor [common pool resource] usage, and to gradually sanction for misuse, they are empowered to truly manage the [common pool resource] and not just impact (or abuse) it."[247] In such a project, local government can recognize, as beneficiaries, that watershed investments yield restored or enhanced watershed services.

V. CONCLUSION

As noted in the Millennium Ecosystem Assessment, trends towards local governance of watersheds have occurred on the international level and have focused on increasing the capacity of local governments to engage in effective watershed planning:

> There has in recent years been increased interest in the development of mechanisms to encourage and support the capacity of local communities to contribute to the management of inland waters, particularly where local knowledge and experience can be constructively used. Recognition of the beneficial outcomes that can occur when local people are involved in the management of inland waters and their services now underpins efforts by the Ramsar Convention to encourage best management practices.[248]

Local governments are essential to watershed health not just because the regulation of land completes the efforts of pollution control by federal agencies, nor just because localities identify with the goals of watershed management in a different way from their state and federal counterparts, but also because the character of local regulation is more inclusive of the variety of ways we interact with and impact watersheds. From this perspective, it is not enough that just *anyone* is managing the watershed; effective watershed

246 *See id.* at 149 (arguing that effective watershed conservation requires vertical and horizontal collaboration).

247 Rosenbloom, *supra* note 56, at 31.

248 C. Max Finlayson et al., *Inland Water Systems*, *in* 1 ECOSYSTEMS AND HUMAN WELL-BEING: CURRENT STATE AND TRENDS 551, 575 (2005), *available at* http://www.millenniumassessment.org/documents/document.289.aspx.pdf (citation omitted).

management institutions must be built upon the manner in which watershed services are important and valued in local—and perhaps regional—contexts.

The benefits of sound watershed investments will often reach beyond water rights, beyond water quality, beyond water navigation, and beyond land-use planning. Nevertheless, watershed decisions and impacts are generally determined by the disposition of each of these areas of law, and each of these areas has traditionally operated independently in a way that fragments both the concept of and interaction with watershed functions. What is special about local governance of watersheds is the manner in which local interests converge with the needs of watershed functions and how this alignment becomes clear in the light of an ecosystem services valuation.