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Committee on Transportation and Infrastructure

Subcommittee on Water Resources and Environment

U.S. House of Representatives

on

Sustainable Wastewater Management

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by

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Introduction

Good morning, Chairwoman Johnson, Ranking Member Boozman, and members of the Subcommittee. My name is Andrew Fahlund and I am Vice President for Conservation for American Rivers. American Rivers is the preeminent national advocate for healthy rivers and the communities that depend upon them. We believe that rivers and clean water are vital to our nation's health, safety, and quality of life, and on behalf of American Rivers' 65,000 members and supporters, I thank you for holding this hearing, *Sustainable Wastewater Management,* and for the opportunity to testify.

American Rivers applauds the Committee for spotlighting the need for a sustainable approach to protecting and restoring our water and water infrastructure. This moment in time offers a unique opportunity for Congress to put forth a new vision for sustainable water management. The public has recently come to understand that we must transform our approach to energy by embracing efficiency and renewable technologies that rely upon nature to fuel our economy in the 21^{st} century. We need a similarly transformative model for water infrastructure. To protect our rivers and our communities, we must adopt and apply a definition of infrastructure that integrates our built and natural assets, using "green" infrastructure as an effective way to reduce polluted stormwater runoff and sewer overflows while making our communities more resilient to a changing climate.

We urge the Committee, and Congress as a whole, to adopt policies and funding that promote and require green infrastructure solutions. Green infrastructure solutions are by their nature flexible and cost-effective and will work best and most effectively in a world dominated by climate change and new economic challenges. This testimony will address the following topics:

I. A vision for 21^{st} century water infrastructure;
II. What is "Green infrastructure";
III. Multiple benefits of green infrastructure;
IV. Green infrastructure recommendations.

I. A Vision for 21st Century Water Infrastructure

A new vision for sustainable water infrastructure is one that integrates traditional and green infrastructure in a way that works with nature instead of against it. Green infrastructure works by protecting and restoring streamside buffer zones and wetlands to reduce pollution, by treating stormwater runoff on-site instead of causing sewer overflows and downstream pollution, and by reducing potable outdoor water use to reduce energy use and polluted runoff. Green infrastructure approaches are cost-effective and focus both on protecting existing natural features as well as restoring and integrating natural functions at the site, neighborhood, and watershed scale. Healthy floodplains, small streams and wetlands, and streamside buffer zones are key parts of our water infrastructure and should be considered our first line of defense against floods, droughts and pollution, while in developing areas we must integrate techniques such as green roofs and rain gardens to reduce, reuse and clean our water.

Background

As the Committee is well aware, clean water is at the heart of our communities and we cannot take it for granted. It is our most precious natural resource, essential to the health and well-being of our communities, economy and ecosystems. Since 1972, the Clean Water Act (CWA) has greatly reduced the discharge of raw sewage, chemicals, and other pollutants to our water bodies, and the number of water bodies meeting water quality standards has doubled over that time. Yet in recent years water quality has deteriorated, and year after year, many rivers and streams continue to be too polluted for fishing, swimming, or for other purposes.[1] In 2006, EPA found that only 28% of the nation's stream miles were in good condition.[2] Water and wastewater systems now receive a D-, the lowest grade given by the American Society of Civil Engineers in their evaluation of

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[1] *See e.g.* U.S. EPA, *National Water Quality Inventory: Report to Congress, 2004 Reporting Cycle* (Jan. 2009) http://www.epa.gov/owow/305b/2004report/ reporting that 44% of stream and river miles assessed by states are impaired and do not meet their designated uses.
[2] U.S. EPA, *Wadeable Streams Assessment: A Collaborative Survey of the Nation's Streams*, EPA 841-B-06-002, Dec. 2006 http://www.epa.gov/owow/streamsurvey/.

our nation's entire infrastructure.[3] Aging sewers and treatment plants, growing population, and sprawling development patterns strain our existing clean water systems; and without increased investment and improvement in sustainable infrastructure, the level of sewage pollution in the nation's waterways is predicted to increase to pre-1970 levels by 2025 – the highest ever recorded.[4]

At the same time we continue to lose crucial elements of our natural clean water system such as headwaters streams, wetlands, forests, riparian lands, and natural floodplains from causes including development and reduced protection under the CWA. In a study on the significance of riparian, streamside lands, the National Research Council found that, "loss of natural riparian vegetation is as much as 95 percent, indicating that riparian areas are some of the most severely altered landscapes in the country."[5] In the Chesapeake Bay Watershed, a population increase of eight percent over a ten year period from 1990 to 2000 corresponded with an increase of 40 percent in paved and other impervious surfaces over the same period, destroying the capacity of our natural infrastructure to provide clean water.[6]

Small streams and wetlands comprise over 60% of our stream miles and are critical to providing clean and safe water to downstream communities.[7] More than 7,400 public drinking water supply intakes providing drinking water to over 110 million Americans are located in source water protection areas that contain headwater, intermittent, or ephemeral streams.[8] Yet, protection for these streams is weakening as hundreds of CWA

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[3] American Society of Civil Engineers, Report Card on America's Infrastructure, 2009, accessed online Jan 28, 2009, http://www.asce.org/reportcard/2009/index.html

[4] U.S. EPA, *Progress in Water Quality: An Evaluation of the National Investment in Municipal Wastewater Treatment* (June 2000). http://www.epa.gov/owm/wquality/benefits.htm

[5] National Research Council, *Riparian Areas: Functions and Strategies for Management*, National Academy Press (March 2002). This same study pointed out the tremendous value and importance of these areas in filtering pollutants, lowering water temperatures, maintaining river flows, and providing wildlife habitat.

[6] U.S. EPA, Evaluation Report no. 2007-P-00031: *Development Growth Outpacing Progress in Watershed Efforts to Restore the Chesapeake Bay* (September 2007)

[7] See Judy L. Meyer et al. *Where Rivers Are Born, The Scientific Imperative for Defending Small Streams and Wetlands*, American Rivers and Sierra Club (2007) http://www.americanrivers.org/site/DocServer/WhereRiversAreBorn1.pdf?docID=182.

[8] *Id*. and EPA Assistant Administrator Benjamin H. Grumbles letter to Association of State Wetland Managers (2005), http://www.aswm.org/fwp/letterbg.pdf

enforcement cases have either been dropped completely or lowered in priority due to legal uncertainty.[9] Protecting existing natural infrastructure also reduces the burden on existing hard infrastructure, and should be the first tenet for protecting clean water. The effectiveness of this proactive approach to protecting our natural infrastructure is illustrated by New York City's $600 million investment in Catskills land protection and restoration, which saved $6 billion in capital costs to construct a water filtration plant as well as $200-300 million in annual operation and maintenance costs.[10]

Finally, our most sophisticated climate models predict more frequent and severe droughts and more frequent and intense floods, often in the same place. Both of these extremes will serve to further stress clean water.[11] More extreme rainfall will result in more sewer overflows in some regions,[12] while increased runoff will increase pollutant loads to streams and rivers and algal blooms will become more common in areas with warmer water.[13] Periodic droughts will result in lower streamflows reducing the ability of water bodies to adequately assimilate pollutants and meet water quality standards. Both extremes of global warming will likely increase the frequency of waterborne disease outbreaks.[14]

While it is generally accepted among scientists that under climate change most places will experience more frequent and intense storms and droughts, the closer one applies those models to local conditions, the greater the uncertainty about what to expect. This

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[9] U.S. EPA, Memo from Office of Compliance and Enforcement (Feb 2008) http://oversight.house.gov/documents/20081216113901.pdf.

[10] "Ecosystem Services: A Primer." The Ecological Society of America. August 2000. http://www.actionbioscience.org/environment/esa.html.

[11] Kundzewicz, Z.W et al. "Freshwater Resources and Their Management." Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry et al. Eds., Cambridge: Cambridge University Press, 2007. 173-210.

[12] See e.g. U.S. EPA, *A Screening Assessment of the Potential Impacts of Climate Change on Combined Sewer Overflow (CSO) Mitigation in the Great Lakes and New England Regions*, DRAFT Report, EPA/600/R-07/033A (2006).

[13] Bates, Bryson et al. "Technical Paper on Climate Change and Water." Geneva: Intergovernmental Panel on Climate Change, 2008, p. 53-4.

[14] Kari Lydersen, *Risk of Disease Rises With Water Temperatures*, Washington Post, Oct. 20, 2008, http://www.washingtonpost.com/wp-dyn/content/story/2008/10/19/ST2008101901645.html and Curriero, et al. 2001. *The Association Between Extreme Precipitation and Waterborne Disease Outbreaks in the United States, 1948–1994.*Vol. 91, No. 8, J. Am. Pub. Health Assoc. 1194-1199.

leads to two important and related conclusions about future investment in water infrastructure. First, we should implement the most flexible solutions that will be beneficial whether it is wetter, drier, or stays the same. Second, on the other side of the coin, this need for flexibility argues against significant investment in static, capital-intensive, single purpose investments.[15]

Looking forward

Given this context, we need a new agenda for water in this country that does not rely upon the outmoded approaches of the past two centuries. Because climate change is changing traditional precipitation patterns, the notion that water systems can be designed and managed for a relatively stable range of conditions is no longer true.[16] The Midwest's second "500-year" flood in twenty years is a case in point.

As described below, green infrastructure approaches are just the sort of flexible "no regrets" solutions that provide multiple benefits and work under a wide range of climatic conditions. A green roof will reduce stormwater runoff when it's wet and reduce building temperatures and energy costs when it's hot. Similarly, water efficiency reduces water and energy use and is thousands of times cheaper per gallon than building water supply dams.[17] We can no longer afford to invest in large, single objective infrastructure nor consider our "hard" or built infrastructure separately from our natural or green infrastructure nor do we have to.[18]

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[15] Milly, et al., *Stationarity is Dead: Whither Water Management*, Science, Feb. 1, 2008: Vol. 319. no. 5863, pp. 573–574.

[16] *Id.*

[17] American Rivers, *Hidden Reservoir: Why Water Efficiency is the Best Solution for the Southeast*, October, 2008

[18] In their most recent Report Card, the American Society for Civil Engineers writes: "Sustainability and resiliency must be an integral part of improving the nation's infrastructure. Today's transportation systems, water treatment systems, and flood control systems must be able to withstand both current and future challenges. Both structural and non-structural methods must be applied to meet challenges." American Society of Civil Engineers, *Report Card on America's Infrastructure, 2009*, accessed online Jan 28, 2009, http://www.asce.org/reportcard/2009/index.html.

We need not eliminate engineered systems, such as pipes and treatment plants altogether – nor should we. They are important elements of our clean water system, and many are in desperate need of repair or replacement. But relying solely on fixed engineering solutions will not solve our future needs. Instead, we should optimize the mix of green infrastructure as a cost-effective "first line of defense" to enhance the effectiveness and extend the lifespan of state-of-the-art engineered technologies.

II. What is Green Infrastructure

As a working concept, green infrastructure can broadly be defined as an approach to water management that reduces stormwater runoff, sewer overflows, and flooding by protecting, restoring, or mimicking the natural hydrology of an area. This is often accomplished through the use of plants and soils or engineered solutions that recreate natural processes.[19] In other words: planting trees and restoring wetlands, rather than building costly new water treatment plants; replacing parking lots and driveways with permeable pavement to reduce wastewater treatment demand; increasing water efficiency instead of building new water supply dams; and restoring floodplains instead of building taller levees.[20]

Green infrastructure solutions can be applied on different scales, from the house or neighborhood level, to the broader landscape level. On the local level, green infrastructure practices include rain gardens, permeable pavements, green roofs, infiltration planters, trees and tree boxes, and rainwater harvesting systems that maximize the opportunities for stormwater to infiltrate into the ground or transpire back into the atmosphere. At the largest scale, the preservation and restoration of natural landscapes (such as forests, floodplains, streams and wetlands) are critical components of green infrastructure.

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[19] Gary Belan & Katherine Baer, *Green Communities for Clean Water*, River Network, River Voices 18:1 (2008).
[20] See generally, American Rivers, *Greening Water Infrastructure* http://www.americanrivers.org/site/PageServer?pagename=AR7_GreenInfrastructure_Background.

On the municipal scale, where the primary goal is to reduce polluted stormwater runoff and sewer overflows, the characterization provided by the EPA is useful:

> "When used as components of a stormwater management system, Green Infrastructure practices such as green roofs, porous pavement, rain gardens, and vegetated swales can produce a variety of environmental benefits. In addition to effectively retaining and infiltrating rainfall, these technologies can simultaneously help filter air pollutants, reduce energy demands, mitigate urban heat islands, and sequester carbon while also providing communities with aesthetic and natural resource benefits."[21]

Already, green infrastructure is being used successfully by a number of cities around the country.[22] Chicago, Portland, Seattle, Milwaukee, Philadelphia, San Francisco and others are recognized as leaders in this area. Interest continues to grow as communities recognize the multiple benefits of using cost-effective techniques such as rain gardens, green roofs, and permeable pavement to manage stormwater on-site, reducing the need for expensive, hard infrastructure projects and stretching scarce dollars further.
Just recently, the City of Indianapolis announced that by using wetlands, trees, and downspout disconnection to reduce stormwater flows into their combined sewer system, the City will be able to reduce the diameter of the planned new sewer pipe from 33' to 26', saving over $300 million and also beautifying the city.[23]

Chicago is one example of a city that has emerged as a leader in using an integrated approach to incorporate green infrastructure into planning and retrofits for clean water, cooler temperatures, and more attractive neighborhoods.[24] The city has promoted a wide range of techniques including green roofs, urban forestry, rain gardens, and downspout disconnection. Prompted by the need to reduce combined sewer overflows and Mayor Daley's personal commitment to a greener city, the City has modeled techniques such as the green roof on City Hall as well as subsidies for certain materials and an expedited

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[21] U.S. EPA, *Managing Wet Weather with Green Infrastructure, Glossary of Terms* http://cfpub.epa.gov/npdes/greeninfrastructure/information.cfm#glossary.

[22] See generally, NRDC, *From Rooftops to Rivers: Green Strategies for Controlling Stormwater and Sewer Overflows* (2006) and Water Environment Research Foundation, *Using Rainwater to Grow Livable Communities* (2008) http://www.werf.org/livablecommunities/.

[23] *Sewer Overhaul Mean More Green,* Indystar.com Oct. 14, 2008, http://www.indystar.com/apps/pbcs.dll/article?AID=/20081014/LOCAL18/810140384.

[24] See NRDC, *From Rooftops to Rivers* and City of Chicago, *Chicago Green Roofs* http://www.artic.edu/webspaces/greeninitiatives/greenroofs/main.htm.

green permitting program. One city program provided rain barrels to 400 families at a subsidized cost of $15 each, which are projected to divert 760,000 gallons of runoff from the combined sewer system, reduce localized sewage backups into basements, and cut down on water demand for landscape irrigation. Under the Green Alleys program, Chicago is retrofitting its 2,000 miles of alleyways with permeable pavement to reduce polluted runoff.

Smaller cities and communities are also applying these techniques for clean water at lower costs. In Washington County, Arkansas, the University of Arkansas is designing and implementing a Habitat for Humanity neighborhood using low impact development techniques and forgoing curbs and gutters to minimize flooding by using natural areas to absorb stormwater.[25] By combining measures to slow traffic with stormwater controls, the project is cutting infrastructure costs by half. In Burnsville, Minnesota, a program to replace existing development and impervious surfaces with rain gardens successfully reduced stormwater runoff in an older neighborhood that lacked the space for more conventional and larger stormwater detention ponds.[26] In comparison to the control neighborhood, the raingardens reduced runoff by 90 percent.

In Clayton County, Georgia a constructed wetland system that receives treated wastewater and recharges reservoirs had a consistent supply of water throughout the drought. While surrounding communities had severe water use restrictions and saw reservoirs drop below 50% capacity, Clayton County never dipped below 77% of reservoir capacity.[27] Additionally, the constructed wetland system has saved roughly

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[25] University of Arkansas School of Architecture, *'Green' Habitat Neighborhood Wins National Award*, http://architecture.uark.edu/443.php (last accessed Jan. 28, 2009).

[26] Water Environment Research Foundation, Retrofitting a Suburban Neighborhood with Raingardens http://www.werf.org/livablecommunities/studies_burns_mn.htm (July 2008).

[27] Saporta, M. August 24, 2008. Praise flows freely for Clayton County's water system. Atlanta Journal-Constitution; Associated Press. October 19, 2007. No backup plan in place for drought-stricken Atlanta. Fox News.

$50,000 in annual electricity costs from reduced treatment needs[28] and has eliminated the need for 300 miles of pipes and 20,000 sprinklers.[29]

This surge in interest from cities, towns and counties across America has been enhanced by the EPA's Green Infrastructure Initiative, which has broad support from industry, local government, and conservation groups.[30] Formal recognition by EPA of the validity of using green infrastructure techniques to meet regulatory requirements for combined sewer overflows (CSOs) and stormwater under the Clean Water Act further illustrates the value of these approaches.[31]

III. Multiple Benefits of Green Infrastructure

Green infrastructure should be at the forefront of our infrastructure solutions, in part because of the multiple benefits it provides for communities.

Improving water quality – As mentioned above, many communities use a variety of green infrastructure techniques to reduce stormwater and sewer overflows.[32] Portland, Oregon's natural stormwater management program demonstrates the effectiveness of green infrastructure for controlling stormwater runoff. Portland's program to disconnect downspouts from roofs to prevent them from pouring directly into storm drains keeps more than 1.2 billion gallons of stormwater out of the sewer system every year.[33] Green Street projects, which reduce impervious surfaces and increase tree planting, have been

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[28] Clingan, C. June 2, 2008. Green infrastructure highlights American Wetlands Month. National Association of Counties, County News. Washington, D.C.
[29] Clayton County Water Authority. 2005. 50 years of insight: the story of Clayton County Water Authority (1955-2005). Morrow, GA.
[30] U.S. EPA, *Green Infrastructure Partnership* http://cfpub.epa.gov/npdes/greeninfrastructure/gisupport.cfm. Partners include the Association of Interstate Water Pollution Control Administrators, the American Public Works Association, the National Association of Clean Water Agencies, and the National Association of Environmental Local Government Professionals.
[31] U.S. EPA, *Use of Green Infrastructure in NPDES Permits and Enforcement*, EPA Memo to Regional Water Division Directors State NPDES Coordinators, Aug. 2007. http://www.epa.gov/npdes/pubs/gi_memo_enforce.pdf.
[32] U.S. EPA, Green Infrastructure Types, Applications and Design Approaches to Manage Wet Weather http://cfpub.epa.gov/npdes/greeninfrastructure/technology.cfm (last updated Jan 6, 2009).
[33] Portland Bureau of Environmental Services, Downspout Disconnection Program Brochure, http://www.portlandonline.com/bes/index.cfm?c=43081 (accessed November 11, 2008).

shown to retain up to 94% of rainfall and to reduce pollutants by 90%.[34] Citywide, Green Street projects currently retain and infiltrate 36.9 million gallons of stormwater per year and have the potential to manage 7.9 billion gallons, or 80% of Portland's runoff annually.[35] Green roofs in Portland have shown similarly impressive results, reducing peak storm flows 81-100% and retaining an average of 60% of total runoff.[36]

Milwaukee, Wisconsin is another city that is proactively using green infrastructure to complement hard infrastructure to reduce stormwater and combined sewer overflows. The city has installed rain gardens and helped install or fund green roof installation and actively promotes downspout disconnection for homeowners as well as purchasing and protecting land in the watershed.[37] Modeling by Milwaukee showed that a combination of these techniques would reduce combined sewer overflow volumes by 14% to 38% in each neighborhood.[38]

Green jobs and the economy – Green solutions create good jobs in many sectors, including plumbing, landscaping, engineering, building, and design. Green infrastructure also supports supply chains and the jobs connected with manufacturing of materials including roof membranes, rainwater harvesting systems, and permeable pavement. Covering even one percent of large buildings in medium to large sized cities in the U.S would create over 190,000 jobs while a $10 billion investment in water efficiency would create 150,000-220,000 jobs.[39]

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[34] Portland Bureau of Environmental Services, Stormwater Management Facility Monitoring Report (2006).

[35] Portland Bureau of Environmental Services, About Green Streets Video. http://www.portlandonline.com/BES/index.cfm?c=47429& (accessed December 9, 2008).

[36] Portland Bureau of Environmental Services, Ecoroof Incentive Program, http://www.portlandonline.com/bes/index.cfm?c=48724 (accessed December 3, 2008).

[37] NRDC, *From Rooftops to Rivers* (2006) at 20-22.

[38] *Id.*

[39] Will Hewes, *Creating Jobs and Stimulating the Economy Through Investing in Green Infrastructure*, American Rivers and the Alliance for Water Efficiency (2008) and see, Alliance for Water Efficiency, *Transforming Water: Water Efficiency as Economic Stimulus and Long-Term Investment*, Position Paper (Dec. 2008) available at: http://www.allianceforwaterefficiency.org/AWE_Advises_Obama_Transition_Team.aspx.

Cost savings – The current economic crisis emphasizes the importance of investing in cost effective solutions and avoiding infrastructure investments such as "sewer lines to nowhere" that only serve to compound existing problems by fueling sprawl and causing more water pollution. Several studies have concluded that green infrastructure and conservation approaches to development and stormwater management are environmentally beneficial and more cost effective for communities and developers than conventional stormwater control systems. Those approaches are cost effective in two ways: by providing ecosystem services, such as pollutant removal, groundwater recharge, increased air quality, and flood management, and by reducing costs for construction materials, operations and maintenance, or hard infrastructure.[40] For instance, the California Department of Transportation found that comprehensive use of green infrastructure and low impact development to control stormwater would cost $2.8 – 7.4 billion compared to $44 billion for conventional controls.[41] A New York study showed that green streets, street trees, and rain barrels managed stormwater three to six times more effectively than conventional storage tanks per $1000 invested.[42]

Costs for reducing sewer overflows can also be lowered using these methods – the City of Portland spent $8 million to subsidize downspout disconnections for homeowners keeping one billion gallons of water from entering the city's combined sewer system thus saving $250 million in hard infrastructure fixes that otherwise would have been necessary to reduce sewer overflows.[43] Similarly, downspout disconnections near Flint, Michigan cost approximately $15,000 but provided over $8,000 in savings a month from reduced costs associated with stormwater facility fees and managing combined sewer overflows.[44] Developers using green infrastructure also benefit economically as replacing hard

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[40] See Ed MacMullan and Sarah Reich, *The Economics of Low Impact Development: A Literature Review*, ECONorthwest (Nov 2007) http://www.econw.com/reports/ECONorthwest_Low-Impact-Development-Economics-Literature-Review.pdf.
[41] *Id.* at 21.
[42] *Id.* at 17.
[43] Alexandra Dapolito Dunn and Nancy Stoner, *Green Light for Green Infrastructure*, Environmental Law Institute, Environmental Forum (May/June 2007).
[44] MacMullan and Reich at 16.

infrastructure including curbs, gutters, and stormwater pipes with low impact development techniques can reduce construction costs and increase lot value.[45]

Green infrastructure can also be used to cost effectively reduce localized flooding. In the Towar Garden community in Meridian Township, Michigan, flooding was a recurring problem during even small rain events. Residents regularly experienced drainage problems, basement flooding and sanitary sewer backups.[46] The Drain Commissioner chose to retrofit the neighborhood drainage system with almost six acres of rain gardens to filter and absorb most of the flood water. Construction costs were half of the traditional, structural alternative due to reduced pipe size, excavation and other factors, which more than offset the higher maintenance costs associated with the project.

Water efficiency provides perhaps the best illustration of cost effective alternatives to conventional infrastructure. If the Atlanta metro area undertook a set of common water efficiency practices and policies, it could save as much as one-third of its current water use, twice the amount of water provided by four proposed dams, saving $700 million.[47] Public savings for all of these examples, in turn, can be used to meet other municipal needs.

Other environmental benefits – Green infrastructure can increase ground water recharge, critical in times of drought. It can also minimize localized flooding and soil erosion that can threaten downstream properties and severely damage wildlife habitat and ecological health.[48] More broadly, green infrastructure has been found to improve air quality in

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[45] *Id.* at 24-29, and see U.S. EPA, *Reducing Development Costs through Low Impact Development Strategies and Practices*, EPA 841-F-07-006 (Dec. 2007) http://www.epa.gov/owow/nps/lid/costs07/documents/reducingstormwatercosts.pdf reporting that in 11 of 12 cases, installation of low impact development stormwater was cheaper than that of conventional controls with savings ranging from 15% to 80%.

[46] Towar Rain Garden Drains, MACDC 2008 Innovation and Excellence Award Winner, Ingham County Drain Commissioner, Mason, MI. http://www.towardrains.org/Towar%20Rain%20Garden%20Drains.htm (last accessed Jan. 29, 2009).

[47] American Rivers, *Hidden Reservoir: Why Water Efficiency is the Best Solution for the Southeast*, October, 2008, at 6, http://www.americanrivers.org/site/DocServer/SE_Water_Efficiency_Oct_2008_opt.pdf?docID=8421

[48] Braden, J.B. and D.M. Johnston. 2004. "Downstream Economic Benefits from Storm-Water Management." *Journal of Water Resources Planning and Management* 130 (6): 498-505.

neighborhoods,[49] reduce heat island effect in suburban and urban areas, reduce energy use,[50] increase green space and wildlife habitat as well as improve neighborhood aesthetics.[51] Additionally, implementing green infrastructure is a visible and tangible way for people to become engaged in environmental protection at the neighborhood level.

Climate change adaptation – Managing stormwater may increasingly be synonymous with managing for climate change adaptation.[52] Already, cities are experiencing changes in precipitation patterns that require changes in stormwater planning and management and integrating decentralized green infrastructure approaches will likely be a vital part of any adaptation strategy.[53] Seattle, New York City and San Francisco are evaluating or implementing green infrastructure practices as part of a plan to prepare for climate change impacts. In efforts to prepare and protect communities from the unpredictable changes that lie ahead, stormwater management occupies a central role in proactively adapting infrastructure to climate change. With proper incorporation of green infrastructure, stormwater management systems can have the capacity and flexibility to efficiently handle vulnerabilities associated with climate change, including water quality degradation and increased flood risk.[54]

Human health – Recent studies have shown an association between greener neighborhoods and a lower body mass index for children, suggesting another benefit of green infrastructure at the community scale.[55]

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[49] American Forests. 2000-2006. *Urban Ecosystem Analysis*. Retrieved August 2, 2007, from http://www.americanforests.org/resources/urbanforests/analysis.php

[50] Plumb, M. and B. Seggos. 2007. *Sustainable Raindrops: Cleaning New York Harbor by Greening the Urban Landscape*. Riverkeeper. Retrieved May 3, 2007, from http://riverkeeper.org/special/Sustainable_Raindrops_FINAL_2007-03-15.pdf

[51] U.S. Department of Defense. 2004. *Unified Facilities Criteria - Design: Low Impact Development Manual*. Unified Facilities Criteria No. 3-210-10. U.S. Army Corps of Engineers, Naval Facilities Engineering Command, and Air Force Civil Engineering Support Agency. October 25. Retrieved May 4, 2007, from http://www.wbdg.org/ccb/DOD/UFC/ufc_3_210_10.pdf

[52] Laure Funkhouser, *Stormwater Management as Adaptation to Climate Change*, Stormwater 8(5):17-36 http://www.stormh2o.com/july-august-2007/adaption-climate-change.aspx.

[53] S. Moddemeyer, Decentralized Approaches to Adapt to Climate Change.

[54] Funkhouser, L. supra note 55.

[55] J.F. Bell, J.S. Wilson & G. C. Liu, *Neighborhood Greenness and 2-Year Changes in Body Mass Index of Children and Youth*, Am. J. of Preventative Medicine 35(6) 547-553 (2008).

Energy savings – The energy cost of cleaning and delivering water is often overlooked and must be better integrated into our energy and water decisions.[56] It is estimated that between three and nineteen percent of electricity is used to clean, treat, and convey water, providing an important opportunity to save energy by saving water.[57] Green infrastructure and water efficiency measures reduce energy costs by diverting stormwater from municipal waste treatment facilities, requiring less energy for total treatment costs. It also reduces the demand for highly treated and energy intensive potable water. Investing in efficiency before building new dams and desalinization plants, or pumping water from far away sources represents the most cost effective source of clean and reliable water in addition to saving energy. By replacing 1.3 million old toilets with low-flow models rather than building a new wastewater treatment plant, New York City saved water, energy, and $200 million in taxpayer money.[58]

IV. Green Infrastructure Recommendations

With its responsibility for the oversight and authorization for clean water, the House Transportation and Infrastructure Committee has many opportunities to robustly promote and implement green infrastructure. American Rivers respectfully urges the Committee to adopt the following recommendations:

1. Integrate green infrastructure into broader water infrastructure spending and programs rather than treating it as separate. Mandatory set-asides are critical in advancing these new approaches. Future solutions must fully integrate green and traditional approaches.
2. Hold federal agencies such as the Environmental Protection Agency accountable for facilitating and fostering green infrastructure in their policies, practices, and spending decisions, and support legislation that would further these goals.

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[56] For an overview of this issue, see Michael E. Webber, *Catch-22; Water vs. Energy*, Scientific American Earth 3.0, Vol 18., No. 4 (2-9) (2008).
[57] Don Elder, *Water, Energy and Climate Change*, River Network, River Voice, vol. 16, no. 4 (2006). Numbers differ according to region with California leading the nation at approximately 19%.
[58] New York City Department of Environmental Protection. "Water Conservation Program" Flushing, NY, 2006.

3. Protect and restore existing natural infrastructure critical for clean water by passing legislation to affirm the historic protections of small streams and wetlands afforded by the federal Clean Water Act.
4. Require consideration of the climate and energy impacts of all decisions regarding water infrastructure.
5. Support research and development for innovative integrated green infrastructure but do not postpone investing in "no regrets" strategies today.

Conclusion

Today we have reached a crossroads in how we manage our nation's water. Traditional water infrastructure will continue to play a role, but is designed to solve only a single problem and requires a huge capital investment. We must use this transformational moment to move from 19th Century infrastructure to a wiser combination of green and traditional infrastructure that will meet the needs of the 21st Century. Thank you for the opportunity to testify on sustainable water management and green infrastructure