

ENVIRONMENTAL PLANNING JOURNAL



American Planning Association
Environment, Natural Resources,
and Energy Division
Making Great Communities Happen

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From the Chair

Dr. Jim Segedy, FAICP

What an amazing time we live in (please excuse the bad grammar). The news is filled with stories about issues directly related to Environment, Natural Resources and Energy Planning – or, more accurately, the results of a lack of planning. Charge ahead and we'll figure it out later seems to be the cry. Perhaps I'm being cynical, but that's the way it looks from where I sit. To me it's a wake-up call.

While this is by no means an authoritative discourse on much of anything, if you enter "Environmental Planning" into your favorite internet search engine you get very little beyond Wikipedia®, links to academic programs, publications and consultants. If this is such a hot topic, why are there no reports or BMPs or model ordinances or similar types of environmental planning tools showing up?

We are the leaders of this movement. We are the professionals that should be developing and advocating this kind of thinking and action. We all complain about the ravages of problems with off-shore drilling, alternative energy strategies, oil and gas shale drilling, water quality, air quality, AND we're doing a lot about it, but the word is not spreading. Time for us to get out of passive voice (how many times did your professors in planning school accuse you of that in your papers?!?!?) and make a bold stand for planning.

Join the APA Green Communities group via LinkedIn® and join the Sustainable Communities Interest Group, via the APA website. There are more opportunities in the works.

Yes, it's over used by our profession, but it bears repeating:

Make no little plans; they have no magic to stir men's blood...Make big plans, aim high in hope and work.

Daniel H. Burham

Environmental Planners

Please consider submitting information, pictures, stories or anecdotes about the work you do, how you got into this field, and information about your training and background for the next issue of the ENRE Division Newsletter. Please submit contributions to the current newsletter editor (igurney@uoguelph.ca).

ENRE Activities

Here are some ENRE Division activities to keep on your radar screen:

ENRE Awards:

We will officially reinstitute the ENRE Awards program this year with the awards to be presented during the annual business meeting in Boston during the APA National Conference. Watch for the official announcement. It was agreed at this year's business meeting in New Orleans that the awards will recognize Excellence in Environmental, Natural Resources and Energy Planning. They will not be categorically competitive. If you or your project/plan/program are deemed to be "Excellent" by the committee, they will receive an award. We have chosen to encourage, support and share ALL the excellent work, not just one of what will probably be several excellent people, plans, projects and programs.

ENRE Scholarships and Fellowships:

These are on-going programs of the Division. Stay tuned, information and applications and other details will be going out later this summer.

ENRE Program Grants:

This program has been somewhat ad hoc over the last several years. We would like to make it more of a regular feature of the Division to support innovative projects, programs and research. While our budget for such awards will not be great, we hope that we can encourage the development and dissemination of worthwhile projects, programs and research. Stay tuned, information and applications and other details will be going out later this summer.

Outreach (Webinars, CM offerings and conference sessions):

In our on-going efforts to be an information exchange resource for our members, we will be joining with other groups and organizations to sponsor webinars and other Certificate Maintenance programs via the Internet. We are also sponsoring sessions/workshops at several state and regional conferences this year. Details are still being finalized. Stay tuned, details will be going out later this summer.

Advanced Specialty Certification Exam in Environmental Planning:

As you've seen elsewhere in this newsletter and in various notifications from APA and AICP, this year will mark the first of the Advanced Specialty Exams administered through AICP. This year exams in Environmental Planning and Transportation Planning will be offered. We are finishing up the over year-long exam development process. It is anticipated that applications for those qualified to take the exam will be announced later this summer with the exam itself being offered this November.

ENRE Elections:

We have had numerous discussions about this amongst the division Executive Committee and have announced the *Call For Nominations*. To expedite the process for this year, we will follow the traditional election protocols seeking nominations for Chair and Secretary/Treasurer. See the posting in this newsletter with more to follow via the email blast.

ENRE Bylaw Update:

As our profession changes, and to reflect those changes and the changes in APA and Divisions Council continue to evolve, it's time to take a look at the bylaws that guide how we, as a division of the APA, function to greatest efficiency and efficacy. We have started discussions on this topic and are looking to our members to weigh in. Based on the results of our most recent membership survey and discussions at the annual meeting, the area of greatest need is that governing elections and officers of the Division. We are considering adding as many as three Vice Chair positions, and possibly staggering the election cycle to help maintain some continuity. A formal discussion of these issues and proposed by-law amendments will be discussed via one of the ENRE list servs.

Notices and Events

To have notices or listings of upcoming events of interest to the Division membership published in the newsletter, please forward them to the newsletter editor (jgurney@uoguelph.ca).

Environmental Negotiations for Scientists and Resource Managers

August 31-September 2, 2010, 8:30 A.M. to 5 P.M.

Radisson Hotel-Sacramento

500 Leisure Lane

Sacramento, California 95814

Instructor: Jim Nelson

https://www.nwetc.org/registration_process/reg_opr-301_08-10_sacramento/registration.htm

Description: This workshop provides attendees with improved skills for effective participation in environmental negotiations. Environmental negotiations are often more complex due to their technical and regulatory intricacy, interest from many parties, and the emotional nature of parties involved. This workshop presents basic negotiation concepts, specific environmental applications, and principled (ethical) negotiation approaches for building trust and relationships. Role-playing provides an interactive method of reinforcing negotiation principles, and will be used to teach participants how to recognize commonly encountered tactics while producing responses. Participants will gain a better understanding of negotiation principles, as well as approaches and practices for improving outcomes. In addition, the skills taught in this class will help participants increase their confidence and reduce the anxiety they feel while working to achieve these outcomes. Course materials will provide useful tools for future negotiations.

ENRE Call for Nominations

To Members of ENRE:

This message is to let you know it is urgent that our Division hold elections very soon in order to have new officers in place for the APA leadership meetings in October. The two open offices are Chair and Secretary/Treasurer. (Please see the "Call for Leaders" section below for more information)

I have decided not to run again for the office of Chair because other commitments make it very difficult for me to give ENRE the time and attention its members deserve and I have served as a division chair for more than the maximum number of years allowed by the Divisions Council By-Laws. So this is a special plea to you as members to consider getting involved at the leadership level. It is an excellent opportunity to play a leadership role in the profession as well as meet and work with like-minded colleagues in allied organizations. And, one can play an active role in shaping APA's environmental, natural resources and energy policy and help implement existing policies.

The term of Chair is two years, with the first year starting next spring at the annual conference in Boston. Until that time the Chair-elect is a member of the Executive Committee. After serving two years the Chair becomes Immediate Past Chair for one year, serving primarily in an advisory role, and remaining a member of the Executive Committee. The Chair is expected to attend two Division Council meetings each year, and one of those is at the annual conference. The Chair also presides over the annual ENRE business meeting at the annual conference. There are other administrative tasks such as the annual Division report, and the Chair does represent the Division on joint projects with other organizations.

The term of the Secretary/Treasurer is also two years, but he or she is only required to attend the annual Division meeting at the annual conference to serve as Secretary. During the year, the Secretary/Treasurer keeps track of the Division's accounts and contributes to the annual report.

If an elected official is not subsidized by his or her employer, the ENRE Division will pay travel expenses for the Division Council meetings. The next Chair will be invited to attend the Fall 2010 Leadership Meetings in Washington, D.C. as an observer and the Annual Meeting in Boston. All officers will assume their formal roles at the conclusion of the Annual Meeting in Boston (attending four Division Council meetings (two October meetings in Washington, D.C. and the annual conferences).

Running for office is simple – no petitions, no fundraising. We just need a statement of 500 words describing your leadership experience and why you want to be elected. We will need these statements by July 31st. The ballot will be sent via e-mail on August 15th, and members will have until September 15th to cast their votes.

If you have any questions about what is involved, please feel free to e-mail me at jsegedy@pecpa.org or Ingrid Kelley (Immediate Past Chair) at inkelley@charter.net. I promise to answer promptly. Thank you for considering this opportunity to be of service to ENRE.

Regards,

Dr. Jim Segedy, FAICP; Chair
Environment, Natural Resources and Energy Division
American Planning Association

Call for Leaders...

As the issues that surround the environment, natural resources and energy become more and more a part of the daily lives of our community, we as ENRE Planners are being looked to for guidance and leadership. As the primary group within our professional organization concerned with these challenges we stand ready to respond.

To do this we need help and are looking for some dedicated professionals and emerging professionals to take a more visible role in the division's activities, projects and programs. The ENRE Executive Committee has placed a very high importance on these issues as have those who joined us for the annual meeting in New Orleans. We're looking to you as the future leaders of this professional charge. All positions within the division are open (you've already seen the call for nominations). Positions of Leadership for which we are particularly help include:

- Newsletter Editor,
- Outreach & Communications Coordinator (web, social media, etc.),
- Programs & Projects,
- Awards, Special Projects/Research, Scholarships & Grants,

The positions above will assume primary responsibility for the projects and programs within the ENRE Division.

Specialty Areas:

- Environmental Planning
- Natural Resource Planning
- Energy Planning

The proposed by-law revisions will include these as Vice-Chair positions, if adopted. These positions will serve to develop projects, programs, solicit and/or develop newsletter articles and other programs as appropriate.

All these positions are critical to the future of our profession. These are all positions are viewed as standing committees, that are appointed by the Chair with the advice of the Executive Committee. To that end, all of the above positions will come with a limited budget (including potential compensation) and a responsibility of demonstrated leadership.

If you have any ideas, questions or thoughts, please don't hesitate to contact me:

Dr. Jim Segedy, FAICP; Chair
Environment, Natural Resources and Energy (ENRE) Division
American Planning Association
jsegedy@pecpa.org

Thanks!

Call for Proposals

National Planning Conference 2010: Call ENRE Division By-Right Session Proposals

The ENRE Division would like to invite Division members to submit proposals for the 2011 APA National Planning Conference, April 9-12, in Boston, MA! If you would like to attend the conference as a speaker and have an environmental planning, natural resources, or energy related topic in mind for a session, please consider submitting a session proposal to the ENRE Division. Each APA Division is entitled to ONE conference session by-right.

The deadline for division session proposals is August 3, 2010 (please refer to emails sent out previously regarding this). If your session is not selected by the ENRE Division, it will be automatically forwarded into the general session pool of submittals and reviewed for the general competitive program. All session proposals submitted to ENRE will be reviewed by the Division and APA will be notified of our selected by-right session by August 17, 2010. We are rapidly approaching the deadline but will send out another reminder to all ENRE members when we get closer to the August 3 deadline.

If you have any questions about the session proposal process, please contact ENRE's Session Proposal Coordinator, Danielle Bower, at danielle.bower@chplanning.com or by calling 610-872-7500.

Thank you for your participation and we look forward to reviewing many interesting proposals!

For more information and to submit a proposal online to the ENRE division, please use the link below:

Link to submit a proposal:

<http://www.planning.org/conference/proposals/forms/details.htm?ProposalTypeCode=GEN>

Low Impact Development Manual for the Lower Maumee and Ottawa River Watersheds

By: Katie Swartz and Gary Belan,
American Rivers, Inc.

The Lower Maumee and Ottawa River watersheds are part of the Western Lake Erie Basin in northwest Ohio and discharge to Maumee Bay in Lucas County. Refer to Figure 1 showing the watersheds within the basin.

Lower Maumee River Watershed

Watershed Area: 1,082 mi²
Watershed Population: 295,700
Empties to: Maumee Bay in Lucas County
Land Use: 85% cropland, 9% woodland
Largest Cities: Toledo, Defiance, Bowling Green, and Napoleon
Counties: Fulton, Henry, Defiance, Putnam, Hancock, Wood, Lucas

Ottawa River Watershed

Watershed Area: 180 mi²
Watershed Population: 219,020
Empties to: Maumee Bay in Lucas County
Land Use: 16% woodland, 15% cropland, 53% "other"
Largest Cities: Toledo and Sylvania
Counties: Lucas and Fulton (Ohio); Lenawee and Monroe (Michigan)
Source: *Western Lake Erie Basin Partnership*
www.wleb.org/watersheds/watersheds.html

In the Lower Maumee River Watershed, agriculture is the predominant land use, although activities and infrastructure typical of heavily urbanized areas are also present. Of the 2,150 miles of streams in the watershed, 41 percent are designated as impaired, including the entire main stem of the Maumee River. Agricultural practices, stream channelization, and urbanization have caused the loss of natural features which function to attenuate peak runoff, provide detention, and retain sediment. Loss of these natural processes leads to flooding, erosion, degradation of aquatic habitat, and diminished groundwater recharge.

The land area of the Ottawa River Watershed (180 square miles) is significantly smaller than the Lower Maumee (1,082 square miles) yet the populations are similar. The Ottawa River Watershed is located along the Ohio-Michigan border and drains into parts of Lucas, Fulton, Lenawee, and Monroe counties. First, Introduction 1-2 Low Impact Development Manual second, and many third order reaches of the Ottawa

River drain primarily agricultural regions including the following areas: the reaches west of Metamora, Ohio; the Ten Mile Creek reach north of Sylvania, Ohio extending into southern Michigan; and areas of the southwest portion of the watershed west of US 23/Interstate 475 and south of US 20. Portions of the Ottawa River east of US 23/Interstate 475 and south of the Michigan border run through heavily urbanized areas of Sylvania and Toledo, Ohio.

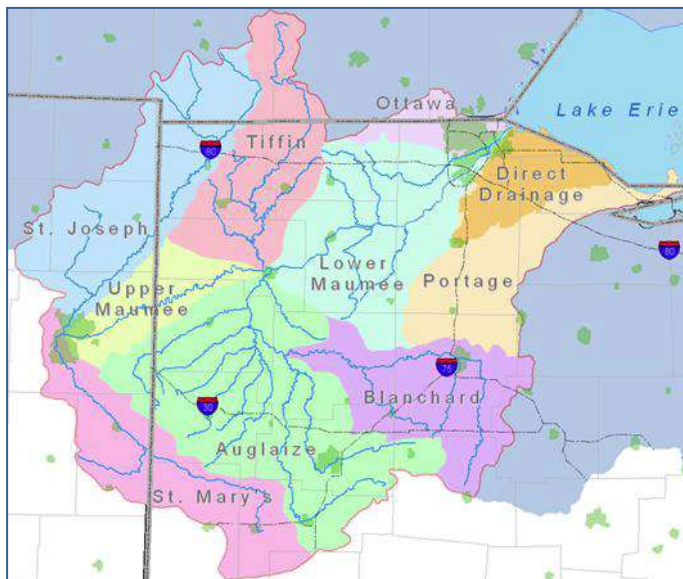


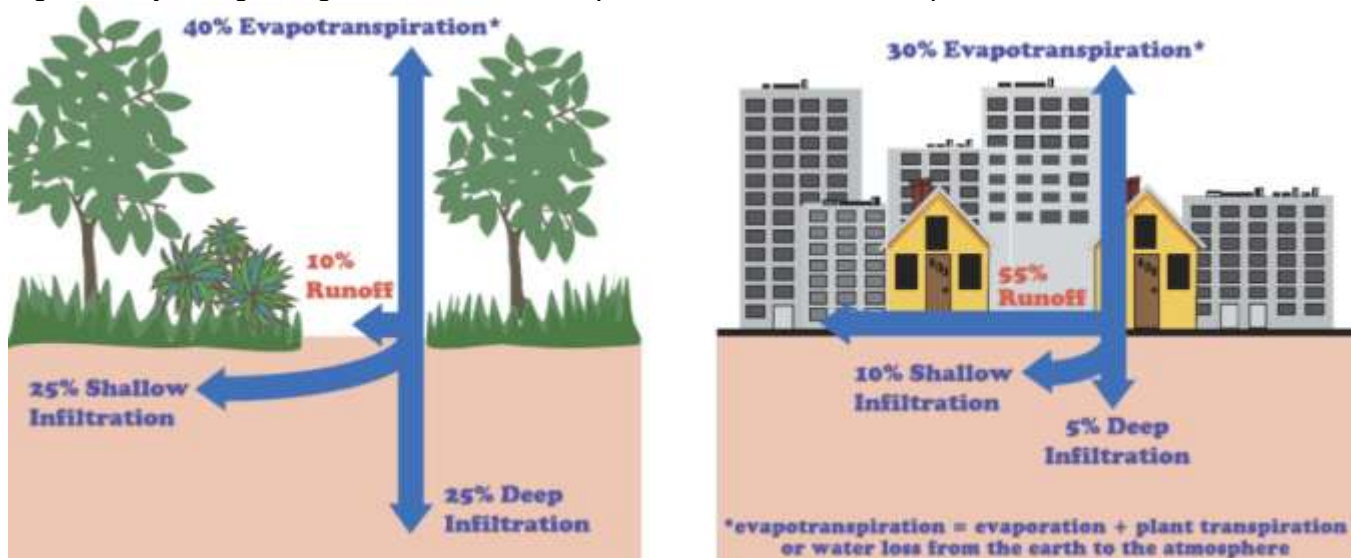
Figure 1: Western Lake Erie Basin Watersheds

Source: Western Lake Erie Basin Partnership

Hydrologic Impacts

Transitioning from a native landscape to a built environment increases the impervious surface coverage including roads, parking areas, sidewalks, and rooftops. These alterations reduce, disrupt, or entirely eliminate native vegetation, upper soil layers, shallow depressions, and native drainage patterns that intercept, evaporate, store, slowly convey, and infiltrate stormwater. See Figure 2. As development progresses, the portion of small watersheds contributing overland flow to receiving waters in minutes increases, while the portion that stores stormwater and delivers subsurface flow over periods of hours, days, or weeks diminishes (Booth et al., 2002). This change in hydrologic regime can significantly degrade stream habitat (Booth, 1991). Recent studies suggest that a subwatershed with as little as 5 to 10 percent impervious cover can negatively impact the quality of the receiving stream (Schuler et al., 2009).

Figure 2: Hydrologic Regime: Green Landscape versus Urban Landscape



Water Quality Impacts

In addition to impacts on stream health caused by hydrologic regime change, impacts are also attributed to stormwater pollution. Impervious cover harbors pollutants from a variety of sources in the urban environment including the atmosphere, lawns, gas stations, parking lots, and streets. Numerous studies have shown that stormwater runoff typically contains the following pollutants (Schueler and Holland, 2000):

- Sediment from eroded stream banks and construction sites;
- Nutrients and pesticides from fertilizer and grass clippings left on pavement;
- Organic carbon from litter;
- Trace metals (copper, zinc, and lead) and petroleum hydrocarbons from vehicles;
- Fecal coliform bacteria from pet and wildlife waste; and
- Chlorides from road salt in cold climates (SEMCOG, 2008).

During storms, pollutants are washed off surfaces and are rapidly discharged to water bodies. A summary of stream response to changes in the condition of the watershed are shown in Table 1-2. Overall, these changes diminish recreational and economical opportunities for communities within the watershed.

Table 1-2 Degradation of Watershed Conditions and Stream Response

Change in Watershed Condition	Response
Increased drainage density due to road networks, road crossings, and stormwater outfalls	<ul style="list-style-type: none"> ▪ Increased storm flow volume and rate ▪ Increased flooding and property damage ▪ Increased channel erosion ▪ Increased fine sediment and urban water pollutant loads ▪ Increased fish passage barriers ▪ Decreased groundwater recharge ▪ Decreased dry weather flow in streams ▪ Increased temperature of runoff and streams
Increased fine sediment deposition	<ul style="list-style-type: none"> ▪ Reduced dissolved oxygen levels in streambed ▪ Loss of fish and macroinvertebrate habitat
Loss or fragmentation of riparian areas	<ul style="list-style-type: none"> ▪ Reduced delivery of large woody debris ▪ Reduced bank stability and loss of bank habitat structure and complexity ▪ Reduced shading and temperature control
Reduced quantity and quality of large woody debris	<ul style="list-style-type: none"> ▪ Reduced channel stability, sediment storage, instream cover for fish and insects, and loss of pool quality and quantity
Increased pollutant loads	<ul style="list-style-type: none"> ▪ Synthetic organic compounds and trace elements: some acutely toxic; tumors in fish; salmon and trout will alter spawning and migration behavior in presence of metals as low as <1% of lethal concentration; endocrine disruptors ▪ Nutrients: excessive aquatic plant growth; excessive diurnal oxygen fluctuations ▪ Synergistic influence of multiple pollutants unknown
Loss of natural streams due to ditching	<ul style="list-style-type: none"> ▪ Permanently removes any ecological benefits they may have ▪ Increased downstream flooding due to a reduced cross-sectional area and reduced channel roughness

Low Impact Development Goals and Objectives

In response to the detrimental impact of impervious cover on receiving water bodies, LID has evolved to become a widespread stormwater management and land development strategy. LID is applied at the parcel and subdivision scale and emphasizes conservation and use of on-site natural features integrated with engineered, small-scale hydrologic controls to more closely mimic predevelopment hydrology. Predevelopment hydrology is described as the hydrology of an area over the full range of rainfall intensities and durations for a predevelopment forested or prairie condition based on historical records describing that site.

Low Impact Development Goal

The primary goal of LID is to prevent harm to streams, lakes, wetlands, and other natural aquatic systems from commercial, residential, or industrial development sites. To accomplish this, LID practices promote infiltration, evapotranspiration, and capture and reuse of stormwater runoff close to its source. Practices range from preserving and restoring natural features to

incorporating rain gardens, green roofs, and other structural BMPs into new site development and redevelopment projects. These LID practices can be used alone, in concert with one another, or in combination with traditional stormwater practices depending on the stormwater management criteria and the characteristics of the site.

Traditional Stormwater Management Goal

In contrast to LID, traditional stormwater management practices focus on efficient collection and rapid conveyance of stormwater away from development to large flood control basins sized to handle large flood events. While this approach can often mitigate to predevelopment peak flows, it is usually not effective in removing the volume of stormwater discharge which results in unnaturally prolonged elevated flows to drain the basin within an acceptable time period. These elevated flows often exacerbate stream bank erosion and contribute to aquatic habitat loss. In addition, concentrated discharges at outfalls cause localized stream damage.

Despite the fundamental differences between LID and traditional stormwater management, a combination of the practices used in these two strategies may be the best approach in meeting stormwater management quality and quantity criteria for a given site.

Low Impact Development Objectives

To mimic the predevelopment hydrology of a site, LID uses the following objectives:

- Minimize total runoff volume;
- Control peak rate of runoff;
- Maximize infiltration and groundwater recharge;
- Maintain stream base flow;
- Maximize evapotranspiration; and
- Protect water quality.

Many of these objectives can be met by minimizing 1) soil compaction, 2) impervious surfaces, 3) direct connection of impervious surfaces, and 4) greenfield disturbance.

Benefits of Implementing LID

The benefits of implementing LID practices can be categorized into environmental benefits, land value benefits, and compliance incentives as studied by the U.S.EPA (U.S.EPA, 2007). The following list describes the benefits largely accepted by the industry. Note that studies quantifying the economic benefit of implementing LID are recently emerging and are much more difficult to discern than studies quantifying traditional stormwater management practices.

Environmental Benefits

- Reduce runoff volume and thus pollutant loadings to receiving streams
- Reduce stream channel degradation from erosion and sedimentation
- Improve water quality
- Enhance the recreational and aesthetic value of the natural resource
- Reduce incidence of illness from swimming and wading
- Improve natural fishery health
- Increase groundwater recharge
- Increase stream baseflow
- Reduce need for stormwater retention facilities
- Reduce water supply treatment costs
- Reduce incidence of combined sewer overflows
- Improve wildlife habitat
- Decrease stream mitigation and restoration costs

Land Value Benefits

- Reduced downstream flooding and property damage
- Real estate value/property tax revenue
- Lot yield
- Aesthetic value
- Public spaces/quality of life/public participation

Compliance Incentives

- Regulatory compliance incentives

Cost Considerations

The following should be considered when comparing costs between traditional stormwater management approaches and LID-based approaches. This information, as well as detailed case studies, is found in *Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices* (USEPA, 2007).

For more information on the cost of “green” stormwater BMPs versus the cost of traditional stormwater systems, go to: <http://greenvalues.cnt.org/>

This Center for Neighborhood Technology website hosts several on-line stormwater management calculators, which are available to use free of charge.

Reduced Material Costs

Traditional approaches to stormwater management involve conveying runoff to receiving waters, to a combined sewer system, or to a regional facility that treats runoff from multiple sites. These designs typically include hard infrastructure, such as curbs, gutters, and piping. In contrast, LID-based designs are designed to use natural drainage features or engineered swales and vegetated contours for runoff conveyance and treatment.

LID techniques, such as conservation design, can reduce the total impervious surface, which results in reduced materials needed for roads, driveway lengths, curbs, and gutters. Reduced material translates to reduced costs. Other LID techniques, such as grassed swales, can be used to

infiltrate roadway runoff and eliminate or reduce the need for curbs, gutters, and sewers. By infiltrating or evaporating runoff, LID techniques can reduce the size and cost of flood-control structures. Note that more research is needed to determine the optimal combination of LID techniques and detention practices for flood control.

Be aware that the use of LID techniques might not always result in lower project costs. The costs might be higher because of the costs of plant material, site preparation, soil amendments, underdrains and connections to municipal stormwater systems, and increased project management.

Reduced Land Cost

Another factor to consider when comparing costs between traditional and LID designs is the amount of land required to implement a management practice. Land must be set aside for both traditional stormwater management practices and LID practices, but the former require the use of land in addition to individual lots and other community areas, whereas bioretention areas and swales can be incorporated into the landscaping of yards, in rights-of-way along roadsides, and in or adjacent to parking lots. The land that would have been set aside for ponds or wetlands can in many cases be used for additional housing units.

Reduced Maintenance Costs

Maintenance requirements should also be considered. Although a 1999 EPA report estimated that maintenance costs for retention basins and constructed wetlands were 3 to 6 percent of construction costs, and maintenance costs of swales and bioretention were 5 to 7 percent of construction costs, there are opportunities to save costs with LID by soliciting volunteers. Much of the requirements for sustaining LID practices involve routine landscape maintenance which homeowners, neighborhood associations, or environmental groups can accomplish. Maintenance of ponds and basins often require heavy equipment to remove accumulated sediment, oils, trash, and unwanted vegetation.

Avoid Stormwater Fees

Municipalities sometimes charge fees when stormwater mitigation requirements are not met, and if they do not now, they may in the future. In urban redevelopment projects where land is not likely to be available for stormwater control, developers can incorporate site-dispersed LID practices in sidewalks, courtyards, rooftops, parking lots, and other small outdoor spaces, thereby meeting the requirements and avoiding fees.

Excerpted from Low Impact Design Manual for the Lower Maumee and Ottawa River Watersheds, published by American Rivers, ©2010. Reprinted with permission. For the full document, visit www.americanrivers.org/library.

Listservs, Anyone?

The ENRE Division membership is diverse, and the main challenge of the Executive Committee is finding ways to serve such a variety of interests. We've decided to set up several list servs to help members with similar interests connect. We'll be sending out more details about this soon, but in the meantime, here are some possible list serv subject areas:

Potential Listservs:

- Water Resource Planning
- Urban Environmental Planning
- Regional Environmental Planning
- Sustainable Community Planning and Design
- Parks and Recreational Planning
- Public Lands Planning
- Hazard Mitigation Planning
- Energy Planning (Supply-Side and Demand-Side)
- Natural Resources Planning

Drop me a quick e-mail by August, 1st, 2010 and let me know which you would like to participate in. We'll only start the ones you ask for!

Also, we're looking for someone with experience to host one or more list servs, and we will make a stipend available. Are there any planning students out there interested in this proposition?

We also have a Facebook page and a LinkedIn page.

Natural Security: How Sustainable Water Strategies are Preparing Communities for a Changing Climate

by Will Hewes & Kristen Pitts
American Rivers, Inc.

Clean water is essential to our health, our communities, and our lives. Yet our water infrastructure (drinking water, wastewater, and stormwater systems, dams, and levees) is seriously outdated. In addition, we have degraded much of our essential natural infrastructure (forests, streams, wetlands, and floodplains). Climate change will worsen the situation, as rising temperatures, increased water demands, extended droughts, and intense storms strain our water supplies, flood our communities, and pollute our waterways. The same approaches we have used for centuries will not solve today's water challenges. We need to fundamentally transform the way we manage water. A 21st century approach would recognize "green infrastructure" as the core of our water management system. Green infrastructure is the best, most cost-effective, and flexible way for communities to deal with the impacts of climate change. It has three critical components:

- Protect healthy landscapes like forests and small streams that naturally sustain clean water supplies.
- Restore degraded landscapes like floodplains and wetlands so they can better store flood water and recharge streams and aquifers.
- Replicate natural water systems in urban settings, to capture rainwater for outdoor watering and other uses and prevent stormwater and sewage pollution.

Many forward-looking communities have become more resilient to threats such as flooding, sewage pollution, and limited water supplies by embracing green infrastructure. American Rivers has conducted in-depth research on eight communities' sustainable green infrastructure approaches that provide clean water, conserve rivers and eco -systems, and provide a wide array of benefits to people and wildlife in the face of climate change. The featured communities have taken steps to prepare themselves in four areas where the effects of climate change will be felt most: public health, extreme weather, water supply, and quality of life. In each case, these communities could achieve even more by extending their use of green infrastructure strategies and working with neighboring communities to apply these approaches throughout their watersheds.



Map of case study communities highlighted in this report.

IMPROVING PUBLIC HEALTH

Portland, Oregon — In response to stormwater runoff and sewer overflows that have long degraded water quality and threatened public health, Portland adopted a number of green infrastructure solutions in conjunction with expanding sewer and stormwater pipes. The city's "greenstreet," eco-roof, and downspout disconnection programs, while still in early stages, currently capture 8 percent of the city's annual stormwater runoff and have the potential to absorb about 50 percent. By 2011, Portland's investments will reduce sewage overflows by 96 percent. Green infrastructure will provide the added capacity and flexibility to minimize stormwater problems and protect public health even as extreme storms grow more frequent and intense in a changing climate.

Staten Island, New York — To overcome the problems of septic tanks leaking sewage into streams and persistent flooding caused by stormwater runoff, Staten Island constructed sanitary sewers and created an innovative stormwater system that utilizes streams and wetlands to transport and treat runoff. The program has drastically reduced flooding and improved water quality, effectively removing 65 percent of total organic carbon, 93 percent of fecal coliform from stormwater runoff, and most excess nutrients. As storms and droughts become more frequent and severe, the program will continue to protect public health, clean water, and local streams.

REDUCING FLOOD AND STORM DAMAGE

Soldiers Grove, Wisconsin — After years of major flooding in the Kickapoo River Valley, the Town of Soldiers Grove decided to relocate its downtown out of the floodplain. By 1983, 49 homes and businesses had been moved out of harm's way. While massive floods in 2007 and 2008 devastated surrounding communities, Soldiers Grove remained largely protected. As climate change brings more severe storms and floods, Soldiers Grove's forward looking relocation effort will minimize losses and keep residents safe.

Charles River Basin, Massachusetts — To prevent recurring floods that had caused extensive damage in Boston and neighboring communities, the Army Corps of Engineers created an innovative plan to acquire and protect more than 8,000 acres of wetlands along the upper reaches of the Charles River. Those wetlands help prevent \$40 million in flood damages every year. As precipitation increases and storms become more intense in a changing climate, wetlands will continue to provide cost-effective and natural protection against floods.

SECURING CLEAN WATER SUPPLIES

Clayton County, Georgia — While most southeastern communities experienced major water shortages during the 2007-2008 drought, Clayton County was an exception. An innovative water recycling system that filters treated water through a series of constructed wetlands helped the county maintain an abundant water supply throughout the record-setting drought. While nearby Atlanta's Lake Lanier shrunk to a 90-day supply of water, Clayton County maintained a 230-day supply in its reservoirs. As climate change makes precipitation more variable and uncertain, Clayton County's water capturing and recycling system will ensure a secure and reliable water supply for its residents.

Seattle, Washington — Population growth in the Seattle metropolitan area has strained water supplies during the past several decades. To maintain a consistent supply and ensure enough water remains in streams for ecosystem health, Seattle Public Utilities has undertaken a number of water conservation and efficiency measures. The city has reduced water consumption by 26 percent and per capita water use by 33 percent since 1990. Combined with protecting the lands surrounding drinking water sources and taking a flexible approach to planning, water efficiency and conservation measures will allow Seattle to maintain a safe and consistent supply of water even as rising temperatures reduce the snowpack that the city relies on to fill its reservoirs.

ENHANCING LIVABILITY

Augusta, Maine — When the Edwards Dam was removed in 1999, the Kennebec River began to restore itself. Water quality improved and fish stocks rebounded rapidly. The river's restoration has created new recreational opportunities, boosted the local economy, and improved the quality of life in Augusta. As climate change threatens clean water and fish and wildlife, a healthy Kennebec River will be better able to adapt to changing conditions and allow Augusta to remain a vibrant community.

Grand Junction, Colorado — Grand Junction's rivers were once forgotten places with uranium tailings, salvage yards, and a landfill along their banks. Gradually, local river clean-up projects turned into a valley-wide effort to reclaim the rivers as social, economic, and recreational amenities. Through the creation of riverfront trails and parks, restoration of the riverfront has helped stimulate economic growth and improve quality of life in Grand Junction. The community's restoration efforts will help keep quality of life high, in spite of the challenges brought by climate change.

RESILIENT COMMUNITIES

In sharp contrast to traditional water management approaches that rely solely on pipes, levees, and dams, 21st century green infrastructure solutions preserve and restore natural landscapes, prevent wasteful water use, and work with nature rather than against it. While traditional water infrastructure—dams, reservoirs, pipes, and levees—will continue to have a role, this kind of engineered infrastructure is static and only attempts to solve a single problem. It requires a huge expense to build and maintain, damages the environment, and often exacerbates the problem by causing more development in harm's way. Communities that invest in a broad suite of green infrastructure approaches like the ones described above will lessen the impacts of an increasingly volatile climate by improving the health of valuable ecosystems, providing flexibility to handle a wide range of conditions and uncertainty, strengthening local economies, and securing multiple benefits. Communities that work with neighboring communities to adopt these cost effective, flexible solutions will thrive in spite of the great challenges that climate change is bringing.

Excerpted from Natural Security: How Sustainable Water Strategies are Preparing Communities for a Changing Climate by American Rivers, 2010. Reprinted with permission. For the full report, please see www.americanrivers.org/library.

