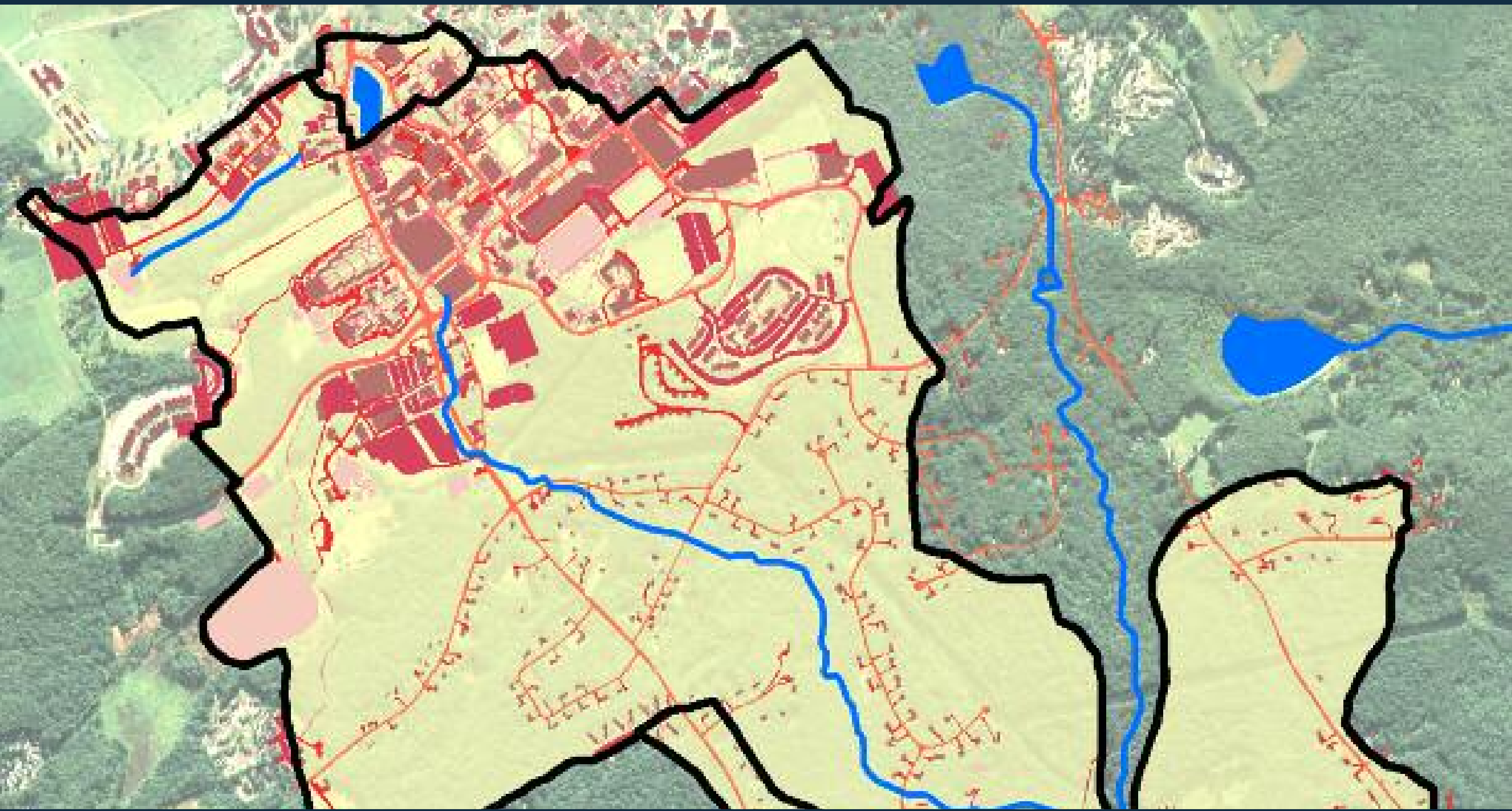
Responding to an Impervious Cover-Based TMDL

A Brief Step-By-Step Guide



Center for Land Use Education and Research

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This publication was funded by the CT DEEP, through an EPA Clean Water Act Section 319 Nonpoint Source Grant.

CLEAR publication # 110830.1

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Introduction

Water Resource Regulation and Surrogate Indicators

In the developed and developing landscapes of Connecticut, many watersheds suffer from what is often known as "urban stream syndrome," degradation of our water resources that results from a complex combination of factors related to urbanization. The individual roles of each of these factors are extremely difficult to determine, making traditional regulatory approaches challenging to implement. Consequently, in the future Clean Water Act programs like the National Pollutant Discharge Elimination System (NPDES) Stormwater permitting program (also known as the "Stormwater Phase II" or "MS-4" program) and the Total Maximum Daily Load (TMDL) program are likely to expand their use of *surrogate* indicators as a way to quantitatively address urban stream syndrome. Surrogate indicators are measurable waterway or landscape characteristics that scientific research has shown to be closely correlated with water quality or watershed health. Impervious surfaces, or the impenetrable hard surfaces associated with development (roads, rooftops, parking areas, etc.), are just such a surrogate indicator. Together, these impervious surfaces are often known as impervious land cover, or impervious cover (IC) for short. Since the close relationship of IC to watershed health is well documented in the scientific literature, many expect to see an increase in the number of towns subjected to an impervious cover-based TMDL or other regulation.

(Top) Eagleville Brook watershed in Mansfield, Connecticut was the focus of the first impervious cover-based TMDL in the nation. (Bottom) Although Mansfield is primarily a rural town, the Eagleville watershed includes much of the University of Connecticut campus, which is quite heavily developed. In parts of the campus, the Brook is piped underground and can be as much as 12 feet below grade, as can be seen in this photo taken from the top of a storm sewer access point.

The Purpose of this Booklet

This booklet is meant to provide succinct, step-by-step guidance for communities who are required to use an impervious cover-based framework for protecting and restoring their water resources. However, it can be used by any community, regulated or not, since there are advantages to using this type of approach to stormwater management (see next section). While it doesn't get into the fine details of each step, most of which must be determined case-by-case, it should provide the reader with a good feel for the major tasks involved, and how to go about them.

The booklet is based on the experience of the *Nonpoint Education for Municipal Officials (NEMO)* Program of the University of Connecticut Center for Land Use Education and Research (CLEAR) and its partners in helping to fashion a practical response to the first impervious cover-based TMDL in the nation. This TMDL was issued for Eagleville Brook in Mansfield CT in 2007 by the Connecticut Department of Energy and Environmental Protection (CT DEEP). The project team included CT DEEP, several units of the University of Connecticut, the Town of Mansfield, and consulting experts from the Center for Watershed Protection and the Horsley Witten Group.

CLEAR's Nonpoint Education for Municipal Officials (NEMO) Program has been educating Connecticut communities since 1991 on plans, regulations, and development practices that help to protect water resources as a community grows.

For more information about workshops contact the CT NEMO Program Director, or visit the website (below).

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The Concept of an Impervious Cover-based TMDL

As noted, the first major aspect of an IC-based TMDL (we will risk coining a new acronym here, "IC-TMDL") is that it is a surrogate approach—impervious surfaces don't normally generate pollutants but they are a good indicator of urbanization, and since they provide an expressway for runoff-borne pollutants into our waterways, they are also a good indicator of urbanization-caused pollution. An IC-TMDL should thus serve to focus attention not just on impervious cover, but on the direct connection between paved surfaces and waterways.

So, while actually reducing the amount of IC is desirable, it is not the primary focus of an IC-TMDL. Rather, the response should be devoted primarily to devising ways to short-circuit, or *disconnect*, the pavement-to-waterway connection. This is primarily accomplished through the use of what are often referred to as low impact development (LID) practices. LID is a suite of site-level techniques designed to accept stormwater runoff from IC and get it back into the ground, while also providing some pollutant removal through the natural processing of native soil and vegetation.

As development increases in a given watershed, changes occur to the water quality and quantity of the receiving stream. (Top) Streams in less developed watersheds typically exhibit a meandering form with banks stabilized by vegetation. (Bottom) Streams in highly urbanized areas often need to be channelized to control flooding and erosion problems resulting from large pulses of stormwater.

Why an IC-TMDL May Make Your Life Easier

Responding to any water regulation is a challenge, but the impervious cover approach gives you several advantages over more traditional methods. Below are three main reasons why. It should be noted, however, that this is a new approach and like all new approaches, there are still questions to be worked out.

1. **The concept is easy to understand.**

   You don't have to be a PhD in water chemistry and aquatic biology—or hire one—to understand the issue. The goal of reducing runoff from paved surfaces is a lot simpler to grasp than, for instance, reducing milligrams per liter of nitrogen or colonies of bacteria per 100 milliliters. Therefore, as you develop and implement your response plan, it will be more easily understood by the various key players in the land use development process: planners, commission members, developers, land owners, and the public.

2. **Impervious surfaces comprise an identifiable, tangible "pollutant."**

   Unlike chemical or biological water constituents, impervious cover is pretty easy to identify. It's safe to say that we all know what a parking lot looks like. This tends to make IC easier to locate, measure, map, and track—tasks essential to responding to a TMDL.

3. **IC is (mostly) under your control.**

   With the major exception of state and federal highways, impervious cover is generated by your local land use regulations and the way they dictate how your town is developed. This makes it easier to identify changes in plans, regulations and procedures that need to be made in order to minimize impacts from future development.

A Seven-Step Approach to Using IC as a Framework for Water Resource Protection

The following steps are based on our experience working out a response to the first IC-TMDL in the nation. Information on that project can be found on the project website (below). This booklet also draws from the experience of CLEAR's NEMO (Nonpoint Education for Municipal Officials) program in working with communities on using impervious cover as a way to approach water resource protection (sidebars, pages 4 and 13). That said, we understand that there is more than one way to skin a watershed (or TMDL). You may come up with a better process. In either case, we hope the ideas below will be helpful as you plan your response. Remember that the surrogate pollutant approach is still new, and there will be a learning curve for some years to come.

In 2007, CT DEEP issued the first "IC-TMDL" in the country for Eagleville Brook in Mansfield, CT, which drains much of the University of Connecticut campus (photos, page 3). Working with CT DEEP and the University, CLEAR's NEMO Program assembled a team to prepare a response to this unique TMDL; the team included experts from the national nonprofit Center for Watershed Protection, and the Horsley Witten Group in Barnstable, MA.

Project description and results, including the watershed-based plan for Eagleville Brook, information on recommended LID retrofit sites, and details of implementation projects, are all on the project website.

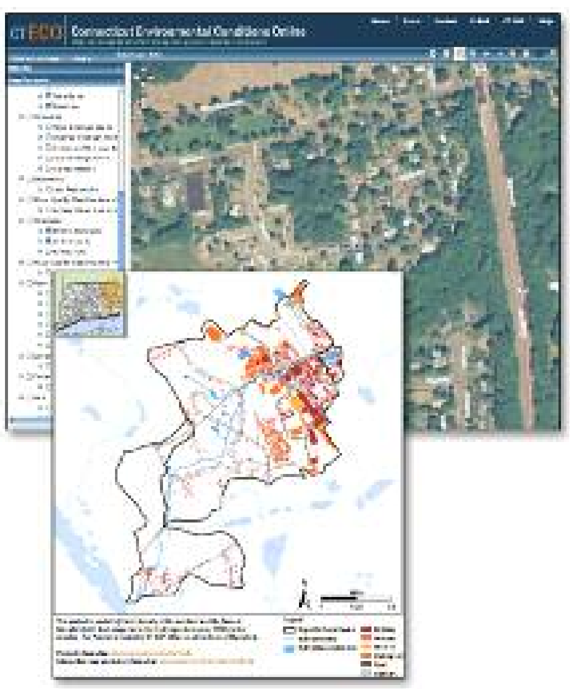
Website:
clear.uconn.edu/projects/tmdl

Step 1

Develop accurate information on total impervious cover in the area (watershed, town) of interest.

Connecticut Environmental Conditions Online, or CT ECO, is an internet mapping site created by CT DEEP and CLEAR. With just a little investment of time, you can access a host of natural resource maps and imagery for any area of Connecticut. Of particular value to a community facing an IC-TMDL would be the high resolution imagery (below, right), which could be used to create an accurate estimate of the amount of impervious cover. Google Maps®, Google Earth®, and Bing® maps might also be sources of high resolution imagery.

Website: cteco.uconn.edu



To respond to an IC-TMDL, a town must first have accurate data on the amount and location of impervious cover. In other words, you pretty much need to know the location of every square foot of pavement and rooftop in your watershed/town. This is for two important reasons. First, you need a baseline from which to measure progress against the numeric limits. Second, you need this information, in the form of a map, to help determine the best LID strategies.

If the regulation itself is based on recent, highly accurate data, then you should be able to obtain this information from the state agency issuing the regulation. However, in many cases the regulation may be based on modeling or other methods that provide a reasonable estimate of the overall picture, but do not provide the geographic specificity and accuracy that you need to craft a site-level response plan. In this case, you must develop your own data and maps.

Mapping of this type requires the use of geospatial (computerized mapping) technology like geographic information systems (GIS) and remote sensing. In the past this would automatically mean bringing in a consultant. This may still be the case. However, these days the critical data layer—high resolution imagery of your town—is publicly available through internet resources like the UConn/CT DEEP CT-ECO website (left sidebar), or GoogleEarth® and GoogleMaps®. Impervious cover then needs to be digitized from these images, which requires some degree of experience and technological know-how. During this step it is useful, but not absolutely necessary, to categorize the IC by major type (roof, road, parking lot, driveway, sidewalk, other); this information will be helpful later as you contemplate solutions.

An example of an image-based, high resolution IC map (left), as well as other maps can be found on the Eagleville Project web page: clear.uconn.edu/projects/tmdl/watershed.

Step 2

Map drainage patterns, and determine connected versus disconnected impervious cover.

An important distinction when dealing with impervious cover is whether it is *connected* or *disconnected*. (Top image) A parking lot which is directly connected to the drainage system, which flows into a nearby stream. (Bottom image) Runoff from the impervious rooftop is channeled via the leader into an extensive lawn area where the water can infiltrate, effectively disconnecting this portion of the roof from the drainage system.

In order to help choose and prioritize stormwater practices, it is important to understand drainage patterns as accurately as possible. Urban drainage is often so highly engineered that surface topography alone is not enough to determine drainage patterns. So, this step is largely a field exercise. In the Eagleville project, our team found that even where detailed stormwater infrastructure maps existed, they were sometimes wrong due to changes made (and not noted) as redevelopment and other building took place. In fact, even the boundaries of the Eagleville Brook watershed, as shown on the state hydrography data layer, were changed as a result of field investigations.

When determining where the water goes, a critical task is to categorize IC as either "connected" (leading more or less directly into the drainage system) or "disconnected" (draining to a pervious area and thus not contributing to stormwater runoff) (left sidebar). Unless you plan to rip up large swaths of road, disconnection, rather than reduction, is likely to be the major focus of your plan to mitigate the impacts of IC. Categorizing existing IC as connected or disconnected is needed to determine the best place for priority stormwater practices; disconnected IC can be pretty much taken out of the equation. However, categorizing IC is not as straightforward as it initially seems. For example, is a roof that drains to a lawn, that drains to a bioretention with an overflow drain disconnected from the stormwater system? Most storms will likely infiltrate into the ground with a system like this, but there are many factors including sizing of the system, soil porosity, turf compaction, and storm size that influence what infiltrates on site and what runs off. Observation during storm events can help to determine how effective these systems are at capturing and retaining runoff.

In some areas, rural roadways for example, a "windshield survey" from the car will be enough to confirm the status of IC. In more urban areas... prepare for sticking your head down a lot of storm drains! (Cover photos show the Eagleville project team doing exactly that.) As you walk the watershed, note the drains and confirm, when possible, where they take the water—by looking. Where there are no drains, note which way the land slopes and where the stormwater goes—this can best be confirmed by going out on a rainy day.

Step 3

Become knowledgeable about the various options for stormwater management, particularly site-level low impact development (LID) options.

As noted, low impact development practices will become your chief tool to respond to an IC-TMDL. Communities must have some degree of familiarity with LID techniques in order to promote and require their use. A list of these techniques includes (but is not limited to): rain gardens, bioretention areas, "green streets" techniques, porous asphalt, porous concrete, permeable pavers, other permeable pavement systems, green roofs, cisterns and rain barrels, engineered vegetated swales, and tree box filters. There are many resources out there for those wishing to study up on LID. A few local and recommended resources for Connecticut communities are:

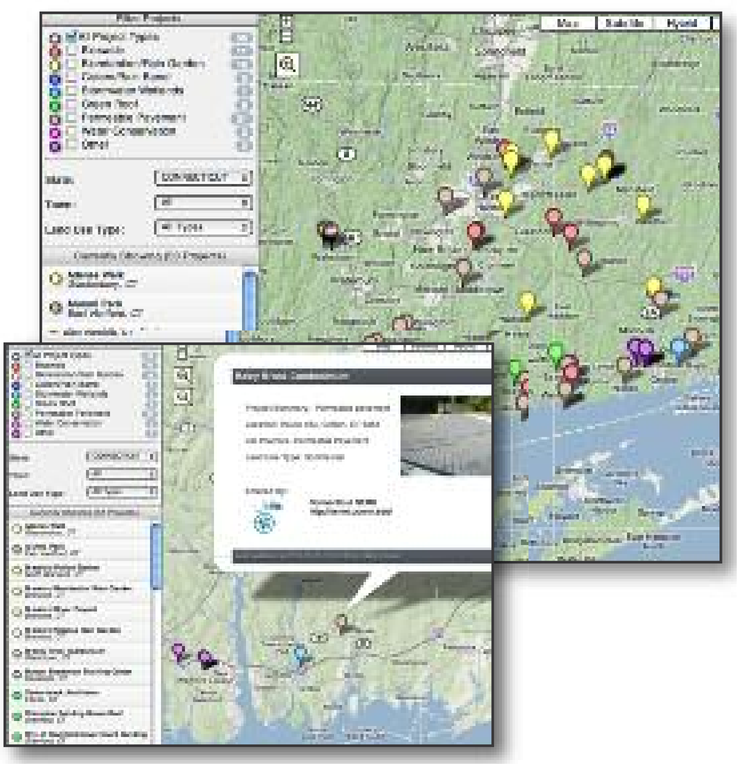
- **CLEAR's NEMO program** has been educating local land use decision makers on LID for almost 20 years. NEMO offers general introductory workshops like Planning for Stormwater, or more technical workshops on LID design and maintenance. Please visit the NEMO Program website and/or contact Michael Dietz, NEMO Director (sidebar, page 4).

- **CT DEEP** has produced a series of brochures on LID and individual LID practices. These can be downloaded from the CT DEEP website—search CT DEEP's "Watershed Municipal Outreach and Low Impact Development page".

- The **NEMO LID Inventory** is a web-based map that is a compendium of LID installations, complete with photos, links, and other information (left sidebar). The goal of the Inventory, which is actually the Connecticut portion of the National NEMO Network LID Atlas, is to help communities overcome their reservations about using new approaches by showing them completed LID projects through the state.

NEMO's CT LID Inventory website uses a Google Maps® "mashup" to display information about LID practices that have been implemented in Connecticut towns. The "balloons" show the location of LID practices, and when clicked on provide photos, links and other information on that particular installation.

Website: clear.uconn.edu/tools/lid



Step 4

Determine a list of potential stormwater retrofit sites, and prioritize.

Examples of stormwater practices, drawn from the UConn campus in the Eagleville Brook watershed. (Top) Permeable asphalt parking lot during a rainstorm, showing water running off adjacent conventional asphalt drive but infiltrating into parking lot. (Bottom) Walkway made of concrete paver blocks set so that water can infiltrate between the blocks.

A "retrofit" is the term often used to describe stormwater practices that are put into place in already developed areas. As the landscape becomes more urban, retrofitting becomes more difficult due to space constraints and the increasing volume of runoff. Even so, urban retrofits are becoming more and more common, even in major metropolitan areas (Chicago has over 7 million square feet of green roof!).

This step comprises the bottom line of your response: it is a combination of your field evaluations from Steps 1-3, a few simple calculations, and deliberation. Unless your community has considerable stormwater management and LID expertise, this step will be the one that is most likely to require some outside technical assistance. However, there are options between a total "Do It Yourself" approach and simply handing the job over to a consultant. The NEMO team's experience is that a community that knows what it wants from a consultant saves time and money, and usually receives a better product as a result.

Once the drainage pattern is understood and IC is mapped and designated as connected/disconnected, it's time to focus on the connected IC. For each expanse of connected IC, a common-sense triage system to help determine retrofit options can be applied:

1. **Remove/reduce the IC footprint, where possible.** This option includes green roof retrofits, reducing the size of parking lots that are being underused, eliminating sidewalks that don't make sense, etc. More often than not, though, this option translates to replacing traditional pavements with porous or permeable pavements such as porous asphalt, porous cement, or paver block systems designed to allow infiltration (left sidebar).

2. **Disconnect IC through vegetated LID practices.** This option is likely to comprise the majority of your retrofit options. Surprisingly, even in highly urbanized areas there are many opportunities to use LID "bioretention" practices that use vegetated cells to receive and treat stormwater. Options range from small "rain gardens" accepting roof runoff to large, linear "green streets" practices that process street runoff (sidebar, page 11).

Step 4 Continued...

Examples of stormwater practices, drawn from the UConn campus in the Eagleville Brook watershed.

(Top) This bioretention cell adjacent to the new academic building in center campus disconnects roof and pavement runoff and allows it to infiltrate into the soil.

(Bottom) A stormwater wetland accepting runoff from the Hilltop Apartment complex is a practice that does not reduce stormwater volume, but does provide water quality benefits.

3. **Treat runoff through water quality stormwater practices.** It's important to remember that although IC provides the focus for the regulation, the end objective is to have a healthier aquatic ecosystem. Removal and disconnection of IC reduce the water quantity impacts of stormwater runoff, and typically provide water quality improvements through the natural processing of pollutants in the soil and by vegetation. However, in some cases, the nature of the site (soils, physical constraints, etc.) make it unworkable to use LID practices. Also, in some cases there may be pollution sources unrelated to IC. In these cases, more water quality-oriented practices should be considered. Practices such as stormwater wetlands or ponds do not necessarily reduce water quantity impacts, but can help remove pollutants from the system. (left sidebar).

Field work for this step can be done as a second field exercise, or combined with your IC and drainage evaluations. Your field assessments should collect the information you need to evaluate your retrofit options. This information includes drainage pattern, impervious cover, available space for retrofits, and other site constraints involving utilities, land ownership, etc. The Center for Watershed Protection (CWP), a national nonprofit that was a partner in the Eagleville Brook project, has devised a Retrofit Reconnaissance Inventory field form that can be used to ensure that all the relevant information is collected. This can be downloaded for free (once you've registered) from the CWP website: www.cwp.org.

Once you have a list of retrofit sites and potential practices at those sites, it's time to prioritize. And, while a priority list is not necessarily a written-in-stone guide for implementation (see next step), it does help to sharpen the focus of your efforts. For the Eagleville Brook project, we prioritized based on consideration of a long list of both technical and non-technical factors. Technical factors included impervious area treated, pollutant removal capability, and runoff reduction. The latter two factors were determined by equations and data taken from the literature. They are not necessarily needed to respond to an IC-TMDL, since the whole idea is that IC is closely related to both quantity and quality of runoff; you should

Step 4 Continued...

Factors used in the Eagleville Brook IC-TMDL project to prioritize LID retrofit opportunities.

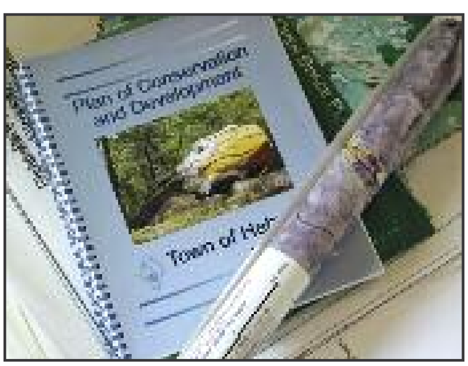
- Impervious area treated
- Pollutant removal capability
- Runoff volume reduction
- Feasibility
- Cost
- Demonstration/education potential
- Maintenance requirements

discuss this with your regulatory agency. Since you have developed an accurate map of watershed IC in Step 1, you should be able to tally up your list and see how the potential disconnection/removal of IC compares to the target figure put forth in the TMDL.

In addition to technical factors, non-technical factors like construction cost, maintenance ease and cost, feasibility, and educational potential were used. Most of these factors will be relevant to your community. In the end, the final list will be the result of a subjective process, with the overall idea to produce a list of retrofit projects that reflects "bang for the buck" in terms of reducing the impacts of IC as effectively, and as cost-effectively, as possible. A list of the Eagleville Brook project technical and non-technical factors is in sidebar, left.

Step 5

Review and make changes to community plans and regulations to emphasize IC reduction/disconnection and the use of LID techniques.

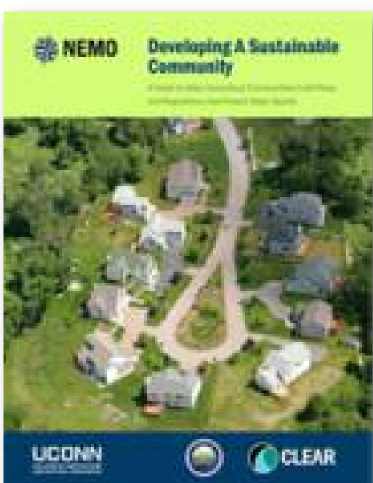


While most of the steps in this booklet address current development, future development must also be addressed. Unless you are in a highly urbanized area where little or no additional development can occur, in the long run retrofit projects are unlikely to protect your water resources if your community's land use plans and regulations continue to promote conventional development design. In order to embrace LID, a town must be willing to go through all its plans and regulations to make them LID-friendly for both new and redevelopment projects—a time-consuming but critical task.

Step 5 Continued...

The NEMO Program has experience in helping Connecticut communities review and update plans and regulations to make them LID-friendly. Reading the NEMO program's *"Developing a Sustainable Community: A Guide to Help Connecticut Communities Craft Plans and Regulations that Protect Water Quality"* publication is a great place to start. It is available on the Publications page of the NEMO website.

Website: nemo.uconn.edu



The NEMO Program can conduct a workshop for your community to help you get started with this process (see contact information, page 4). With many towns finally starting to embrace LID, there are a number of examples that your community can study. Much of this information is included in the 2009 NEMO publication "*Developing a Sustainable Community*" (left sidebar), which goes through all the major LID practices and the typical steps that must be taken in order to promote their use through land use regulations.

One last consideration: as long as you're going through all this trouble, it only makes sense that your community considers promoting LID throughout town. While this does not mean that you have to conduct a drainage and retrofit assessment for all areas outside the TMDL watershed, it does mean that LID for existing and new development should be encouraged in all parts of town, backed up by your Plan of Conservation and Development and your land use regulations. The amount of work involved in changing the regulations for the entire town is certainly no more, and probably less, than creating a special overlay or watershed zone.

A simple mechanism that seems to be growing in popularity is the use of an LID checklist for proposed development. For the Eagleville Brook IC-TMDL, the NEMO team developed a municipal LID checklist, compiled from a number of similar documents in use in Connecticut and Rhode Island, including the new *Rhode Island Stormwater Design and Installations Manual*, which was written by Eagleville Project partner Horsley Witten Group. A checklist is a "performance-based" approach, stating town objectives on implementing LID and requiring the applicant to go through a list of LID practices; for each LID practice on the list, the developer must note if it is being used, and if not, explain why. Rather than referring to specific numerical goals, this approach allows the developer a degree of design flexibility, but also places on the developer the burden of proof for why LID cannot be implemented. The Eagleville checklist is posted at: clear.uconn.edu/projects/tmdl/library/tmdl.htm.

Step 6

Write a Plan to guide implementation.

Examples of stormwater practices, drawn from the UConn campus in the Eagleville Brook watershed. (Top) All roof runoff at this student apartment complex is channeled to rain gardens. (Bottom) This green roof is a major feature of a new academic building built in the heart of the UConn campus.

It's always good to get things down on paper, to document what was done and to lay out a plan and timetable for implementation. Depending on the conditions of your IC-TMDL—or whether you are doing this proactively—the name and format of the document will vary. Our feeling is that briefer is frequently better when it comes to watershed or community implementation plans (others may disagree!).

One key aspect of implementation that emerged in the Eagleville Brook process was the need for, and value of, an **opportunistic approach** to retrofits. Like all plans, the Eagleville Plan has a list of actions and timetable for those actions. However, it is recognized by all the partners that LID retrofit opportunities should be undertaken as they arise, as they do regularly in almost all instances of redevelopment or other site work (for instance, work on underground utilities, repaving projects, and landscaping). These opportunities often make retrofitting more cost-effective and should be seized whenever possible, even if a site is not near the top of the priority list. It may also be that a few small, quickly-implemented projects will help to familiarize local contractors, commissioners and others with LID, and that in this way the community can "work out the kinks" before taking on higher priority projects.

Finally, as noted in the previous step, the Plan should not only address retrofits, but how LID will be encouraged for future development. Because it can be a lengthy process to develop and approve changes to land use plans and regulations, this section (just as the retrofit section) should include a list and timetable of major steps of the process. You might consider appointing a special multi-commission committee to lead this effort.

Plans will vary widely, but to give you an idea...
The EPA Watershed-Based Plan guidance is at: www.ct.gov/dep/cwp/view.asp?A=2719&Q=335504

The Eagleville Brook IC-TMDL Watershed-Based Plan is posted at: clear.uconn.edu/projects/tmdl/library/tmdl.htm

Other Connecticut Watershed-based Plans are at: www.ct.gov/dep/cwp/view.asp?a=2719&q=379296&depNav_GID=1654

Step 7

Track progress and evaluate impact.

Geospatial Training Program

Center for Land Use Education & Research

CLEAR's Geospatial Training Program (GTP) helps municipal land use staff and commission members understand and apply geospatial information technologies to help solve local land use problems and to develop environmentally sensitive land use plans. The program focuses on the use of geographic information systems (GIS), remote sensing (RS) and global positioning system (GPS) technology and online mapping, and introduces new users to these technologies through hands-on training courses. For more information and a schedule of courses, see the GTP website.

Website: clear.uconn.edu/geospatial

The essence of the surrogate pollutant approach is that research over the past 20 years gives regulators a reasonable expectation that decreases in/disconnection of IC will lead to improvements in stormwater-generated impacts to water quantity and quality. So, one of the attractive features of the IC-TMDL approach is that it incorporates a very straightforward metric for progress—area of impervious cover eliminated and/or disconnected.

If you've done a good job mapping and characterizing your IC in Steps 1 and 2, keeping track should be relatively easy. As implementation projects proceed at the site level, the overall area of IC removed or disconnected can be tracked. Remember also that any impervious cover added by new development must be added to your tally—this is a major incentive to have your land use process encourage LID for new development, with a goal of minimizing or eliminating the addition of any connected IC.

It is a good idea to document all the retrofit and new projects. This includes keeping a record of the site plans and the dimensions of the IC involved in the project, as well as taking photographs at various stages of the construction/ redevelopment. Obviously, there are many ways to do this. For the Eagleville Brook project, we decided to track implementation primarily through the use of a "mashup" web map (shown on page 6), which you can create yourself using GoogleMaps®. Photos, documents, and other information can be linked to the specific sites, using GoogleMaps® imagery of your town or watershed. If you're interested in learning about mashups (which require no geospatial expertise to create), check out CLEAR's Geospatial Training Program in left sidebar. The Eagleville project actually has two mashups, one devoted to the list of retrofit opportunities (clear.uconn.edu/projects/tmdl/findings) and a separate one documenting implementation (clear.uconn.edu/projects/tmdl/progress).

Step 8

(of the 7-Step Process)

Make use of this opportunity to educate your citizens.

Partipants at a NEMO workshop in Hartford, CT take advantage of the weather to check out a local rain garden.

From the point of your first retrofit—or even before, when citizens ask you why you're sticking your head down the storm drain—we think you'll be surprised by the level of interest the project will generate. Our experience is that LID practices like green roofs, rain gardens and porous pavement are interesting to many people, if they are educated on what they're looking at and why it's being done. If possible, consider some educational signage, either temporary or permanent, to briefly explain the "what" and "why" of your retrofit projects. Again, the advantage here is that runoff from pavement and rooftops is something that almost everyone has an inherent understanding of. Use this to your advantage in promoting and generating support for your work to clean up and protect your town's waterways. And good luck!

The IC-TMDL Project is a partnership of the Connecticut Department of Energy and Environmental Protection (CT DEEP), the University of Connecticut, and the Town of Mansfield, CT. Major funding has been provided by CT DEEP's Clean Water Act Section 319 Nonpoint Source Program and the University of Connecticut. The Town of Mansfield has also provided funding.

The IC-TMDL Project is led by the Nonpoint Education for Municipal Officials (NEMO) Program of the University of Connecticut Center for Land Use Education and Research (CLEAR). CLEAR provides information, education and assistance to land use decision makers, in support of balancing growth and natural resource protection. CLEAR is a partnership of the Department of Extension and the Department of Natural Resources and the Environment, College of Agriculture and Natural Resources, and the Connecticut Sea Grant College Program.