URBAN STORMWATER RUNOFF

DEFINITION

Introducing impervious surfaces to a landscape can substantially impact receiving streams and waterbodies by increasing both stormwater runoff and its associated pollutants. In addition, data indicates a direct relationship between the amount of imperviousness in a given watershed and the degree of degradation. That is as imperviousness increases, degradation is also likely to increase.

WATER QUALITY IMPACTS & TYPICAL LOADINGS

Nitrogen is a nutrient associated with the *soluble* component of stormwater runoff. Although necessary for plant growth, excess nitrogen in water becomes a pollutant—and stimulates growth of algae and other less-desirable plants. Nitrogen enrichment is typically more problematic in estuarine ecosystems. Major sources in an urban setting include fertilizers, septic systems, and atmospheric deposition. Typical loadings for total nitrogen from urban land uses range from 10 to 15 lbs./ac/yr.

Phosphorus is a nutrient more associated with the *particulate* component of stormwater runoff, since it readily adsorbs—that is, attaches—to sediment. Also necessary for plant growth, excess phosphorous becomes a pollutant typically more problematic in freshwater ecosystems than in estuarine ecosystems. The major source of phosphorus in an urban setting is fertilizer. Some soluble phosphorus can be traced to septic systems; however, the use of low phosphorus detergents has significantly reduced this source. Typical loadings for total phosphorus from urban land uses range from 0.75 to 1.25 lbs./ac/yr.

MANAGEMENT TECHNIQUES & TYPICAL REDUCTIONS

A wide selection of best management practices (BMPs)—including manmade ponds, filtration systems, and infiltration structures—can control pollutants associated with urban stormwater runoff. Until recently, however, such BMPs have largely sought to control the particulate pollutants found in surface runoff—such as sediment and those pollutants which tend to adsorb to sediment, such as phosphorus. Soluble pollutants—such as nitrogen—can be found in both surface runoff *and* subsurface flow.

BMPs that have a vegetative component designed for nutrient uptake and/or an anaerobic component to induce denitrification—such as constructed wetlands, biofiltration systems, and bioretention structures—can reduce these pollutants. Current urban BMP designs remove 10 to 50 percent of total nitrogen, and 45 to 75 percent of total phosphorous.

TYPICAL COSTS

Unique site conditions make "typical urban BMP costs" difficult to determine. Additionally, "per-acre-treated costs" are difficult to provide—mostly due to the economy-of-scale that affords large projects relatively lower costs. Pond construction costs, however, can provide a basis for comparisons:

- ***Residential*** sites with a small project of 10-20 acres typically begin at $25,000, whereas a large project of 100+ acres can exceed $100,000. Median cost is about $50,000.
- ***Commercial*** sites vary greatly. Fast food restaurants or gas stations may be as small as 1 acre; Department or home-improvement stores may be around 50 acres; and shopping centers/malls can exceed 100 acres. Commercial sites typically cost $50,000 to $200,00. Median cost is about $100,000.

More stringent nutrient reduction requirements—particularly for nitrogen—may increase traditional BMP costs 25 to 50 percent. Use of non-traditional techniques such as the Conservation Design approach, however, could check—and, in some cases, actually reduce—costs to below those for current traditional BMPs. (See CONSERVATION DESIGN FOR STORMWATER MANAGEMENT fact sheet).

IMPLEMENTATION ISSUES

Stormwater runoff *from particular industries* is regulated through the federal National Pollutant Discharge Elimination System (NPDES) program, administered by the Surface Water Discharges Section within DNREC's Division of Water Resources.

Stormwater runoff *associated with new development* is regulated under the Delaware Sediment & Stormwater Regulations (the Regulations), administered within the Division of Soil & Water Conservation. The water quality goal under the current Regulations is 80 percent removal of the average annual load of total suspended solids (TSS). The Regulations will, therefore, require revision in order to establish a goal for both nitrogen and phosphorus reduction.

Once these goals have been defined, Regulation revision is fairly straightforward and involves a public review process. Confusion or lack of consensus among stakeholders can complicate Regulation revision, so preparatory education efforts will be key to successful implementation.

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INLAND BAYS WATERSHED

This fact sheet was prepared by the Delaware Department of Natural Resources and Environmental Control's Whole Basin Team, at the request of the Inland Bays Tributary Action Teams, for citizens and stakeholders interested in one of Delaware's most environmentally and economically attractive areas—the Inland Bays and its surrounding lands, surface and ground waters.

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