

DEFINING A STORMWATER MANAGEMENT PLAN: SETTING THE STAGE FOR WATERSHED PROTECTION

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Abstract. We propose a new approach to stormwater control, which we call *The 10-25 Plan*. The 10-25 Plan is a stormwater management framework whose goal is to prevent and mitigate the adverse economic and environmental impacts of stormwater. The framework sets a 10% threshold for impervious surfaces, above which stormwater fees are levied, with a second tier of fees that are imposed when impervious surfaces exceed 25%. Exceeding the 10% trigger would require active stormwater controls, such as the use of stormwater fees at the local level for stormwater prevention and mitigation, as well as onsite stormwater control for new and existing developments. An important priority is the establishment of Watershed Protection Areas (WPAs) in critical water-supply areas. WPAs could be acquired using stormwater fees or by using Transferable Stormwater Rights (TSRs), which are commodities that can be bought, sold, and traded - providing flexibility in meeting stormwater management goals.

INTRODUCTION

Time magazine has called Atlanta the "fastest-spreading human settlement in history" (March 22, 1999). The strains of such growth are evident in the water management challenges facing the region. Excessive pollutant loads have resulted in water quality criteria violations. Enforcement actions established moratoria on new sewer hook-ups in high-development areas of Fulton County. Alabama and Florida uneasily await the day when Metro-Atlanta's water needs exceed supplies.

Additionally, as part of a federal court settlement, federal and state environmental agencies have committed to an expedited schedule for development and implementation of TMDLs, or pollution budgets, for various pollutants on hundreds of waterways throughout Georgia.

To address these challenges, The Clean Water Initia-

tive was established as a joint effort of the Metro Atlanta Chamber of Commerce and the Regional Business Coalition in 2000. The initiative brought together business, governmental, and environmental leaders to suggest strategies to improve water quality and meet future wastewater management needs. The Metropolitan North Georgia Water Planning District (Metro Water District) must draft a watershed plan by May 1, 2003, that specifies measures to reduce the quantity and to improve the quality of stormwater runoff.

An important first step in stormwater management is the need to specify goals that integrate the multiple uses of water, including recreation, fishing, swimming, water withdrawals for industrial and municipal purposes, wastewater assimilation, and hydropower.

The Metro Water District defined the following water resources management goals:

- Preserve and enhance the environmental quality of area watersheds and streams;
- Comply with prevailing regulatory requirements;
- Support continued, yet sustainable, economic development of the region; and
- Consider the water requirements of upstream and downstream users.

The first item is a restatement of the goals embodied in the Clean Water Act of 1972, which requires the protection and restoration of the physical, chemical, and biological integrity of the nation's waters.

In addition to defining water management goals, the Clean Water Act also established a mechanism for establishing performance measures. This approach, embodied in the Total Maximum Daily Load (TMDL) program, regulates the cumulative impacts of environmental stresses on the nation's waters, by establishing warning signs for the need to stop stream degradation before it requires intervention.

Stormwater is a key issue in the TMDL program, but is also related to other water quality and quantity issues,

including erosion and sedimentation, source water assessment and protection plans for drinking water, and intra-and inter-state allocation of water supplies.

PROBLEM STATEMENT

The Metro-Atlanta's Clean Water Initiative identifies stormwater as the area's major source of pollution, concluding that eighty percent of impaired waters are due to stormwater runoff. Stormwater runoff also causes property damage from flooding and bank erosion, and limits economic development due to its adverse impacts on water supplies and assimilative capacities.

Natural forests do not generate stormwater in the urban sense (i.e., overland flow). Nearly all precipitation in a natural forest percolates through the soil and emerges as baseflow or interflow in rivers and streams. Only in areas affected by human land alteration (cities, farms, roads, etc.) do we observe stormwater. We can observe overland flow in forests under unusual conditions, but normally only in riparian areas where the ground has saturated to the surface due to groundwater exfiltration.

The primary contributor to stormwater is runoff from impervious surfaces within the contributing watershed. Impervious surfaces are also linked to decreased quantity and quality of stream baseflow due to decreased infiltration (Rose and Peters, 2001).

Rainfall prevented from infiltrating into the ground by impervious surfaces is commonly diverted as surface runoff into local rivers and streams. The effect of increased peak flows on erosion of streambeds and banks has long been recognized.

In a study of the Chattahoochee River, toxic chemicals increased in direct proportion to the amount of impervious surface coverage. Also, fecal pathogens and nutrients in streams are directly related to impervious surface cover. Contaminants have impaired the health of the Chattahoochee River downstream from Atlanta - fish consumption advisories have been established due to pollution in the river.

The U.S. Geological Survey notes that both the size and frequency of damaging floods dramatically increase as impervious surfaces increase. The increased sedimentation of creeks from runoff costs Atlanta residents many millions of dollars annually in decreased property values.

Thus, increasing impervious surfaces - even small ones - causes surface water runoff to increase, causing flooding and stream channel enlargement, as well as water quality impairments. Impervious surfaces also

reduce property values due to increased flooding.

THE 10-25 PLAN

We propose a strategy, called the 10-25 Plan, for protecting and enhancing the region's water resources by focusing on stormwater management. We propose that a threshold 10% impervious surface measure be used to define when streams are adversely affected by stormwater (Horner et al., 1999; Schueler, 1994), with a second threshold of 25% impervious surfaces defining when streams are impaired (Arnold and Gibbons, 1996; Schueler, 1996).

Elements of the plan address what is required at each of these thresholds. Mandatory actions would be required once the 10% threshold is exceeded. Areas below the threshold may choose to implement elements of the 10-25 Plan to avoid exceeding the threshold. Additional measures are required once the 25% threshold is exceeded.

The proposed plan provides a number of tools for controlling stormwater, including onsite stormwater mitigation, Transferable Stormwater Rights (TSRs), and stormwater fees on impervious surfaces that can be used for stormwater control and mitigation.

Another important element of the plan is the establishment of Watershed Protection Areas (WPAs). WPAs are needed in key areas where drinking water sources are most at risk from contamination. This program would complement current Greenspace programs, and focus resources on sensitive riparian areas.

Stormwater fees could be used to purchase conservation easements or acquire property in WPAs. Also, TSRs could be used by landowners in WPAs to sell or trade impervious surfaces to areas outside the WPA.

Stormwater Fees

A recent analysis by Law Engineering estimates that comprehensive stormwater management for the twelve-county Metro Atlanta area will cost up to \$1.5 billion over the next 20 years, with additional operating costs of over \$500 million. Other studies have estimated the costs to exceed \$6 billion. Regardless of the true costs, the need for effective watershed management will require enormous effort and resources.

An important reason for establishing a stormwater management plan is the need to develop funding mechanisms. Also, stormwater planning requires mechanisms that foster effective stormwater coordination

and cooperation between local jurisdictions.

We propose that the Metro Water District serve as a regional oversight board that maintains a fee and credit structure associated with impervious cover, thereby making impervious cover a *commodity*. A municipality's assessed fee would be based on the percent impervious cover within each watershed in that municipality.

Fees would be directed towards protecting critical water-supply watersheds, acquiring Greenspace, and maintaining and enhancing tree canopy coverage. As impervious surface increases in a watershed, the associated fees increase to reflect the increased cost of stormwater treatment, flood control, and watershed management. Thus, the 10-25 Plan calls for the collection of a stormwater fee only from properties with impervious surfaces within a watershed whenever impervious surfaces exceed 10% of that watershed. When impervious surfaces within a watershed exceed 25%, even well-intentioned management plans cannot prevent stream degradation. Therefore, the Plan calls for areas with impervious coverage exceeding 25% to incur higher fees.

Stormwater fees would be reduced when municipalities employ effective management practices that are demonstrated to increase stormwater infiltration. The fees become a funding source for local governments to improve streams and can:

- Create a valuable commodity - impervious cover. As such, municipalities can buy and trade impervious surface credits with other municipalities within the metro planning district;
- Provide the critical foundation for efforts to improve overall water quality and quantity while reducing the long-term negative economic impact of past development patterns;
- Increase and protect Greenspace and tree cover within watersheds;
- Remove unnecessary impervious coverage and implement stormwater control in the watershed; and
- Providing infiltration methods to mimic natural storage.

Onsite Stormwater Control

A solution to the problems caused by impervious surfaces must address both the increase in runoff and the decreased storage that results. We suggest that local governments be able to gain credits towards decreasing their stormwater fee by implementing mechanisms to limit runoff to predevelopment volumes, such as by

encouraging the return of excess runoff to the soil, thus increasing subsurface storage and drought streamflows.

An important strategy for mitigating the adverse effects of stormwater on downstream property owners and water users is to adopt a policy that encourages onsite stormwater control. Implicit in the use of onsite stormwater control is the recognition that the full costs of land development should be borne by those causing economic damage to others, be they public or private entities.

Clearly, stormwater adversely affects downstream property owners, directly by flooding, as well as indirectly by degradation of the quantity and quality of drinking water supplies. The adverse effects of stormwater are of concern irrespective of whether the source is current or historical development - all sources of stormwater cause problems to downstream communities. Thus, an effective stormwater plan should apply to all land in affected watersheds.

A common engineering approach to control peak discharge rates is detention. Unfortunately, detention only spreads the runoff over a longer interval, without diminishing the volume of stormwater runoff. This approach is often ineffective in preventing stream degradation, and can increase the risk of downstream erosion by failing to reduce total stormflow volumes, and by relying on sediment entrapment instead of soil protection.

Not only does stormwater detention fail to reduce stormwater volumes, it also does little to improve water quality. Stormwater retention, on the other hand, achieves the desired objectives of reducing stormwater peaks and volumes, while at the same time increasing infiltration and ground-water recharge, and also improving surface and ground-water quality.

Clearly, alternative tools are needed to address stormwater management, and incentives are needed to support the use of best available technologies. Proven methods of onsite stormwater retention include permeable pavements, recharge areas, wetland cells, raingardens, wet ponds, drywells, infiltration strips, mulching, riparian buffers, Greenspace, and contour terracing.

Transferable Stormwater Rights

Although some practices can abate the effects of impervious surfaces, they cannot entirely remove them. To address the need for additional tools, we propose the establishment of tradeable commodities for stormwater. The use of markets is intended to provide low-cost

opportunities to control the adverse impacts of stormwater generation associated with land-use development.

A market in Transferable Stormwater Rights (TSRs) allows property owners who are unable to control stormwater the ability to purchase TSRs from others who are better positioned to control their stormwater. Thus, a property owner who inefficiently mitigates stormwater can trade or purchase an TSR from a nearby property owner or entity who can do so more efficiently. TSR transactions should be regulated, so that stormwater is abated locally, and not traded over long distances without regulatory oversight.

Watershed Protection Areas

One strategy for assuring the protection of drinking water supplies and complying with clean water laws is to require lesser density in critical resource areas. In addition to water supply and quality benefits, these Watershed Protection Areas (WPAs) provide Greenspace amenities and enhance the overall quality of life for area residents.

The integrity of Atlanta region's river systems can be restored and sustained by placing upper limits on the degree to which a critical watershed is covered by pavement and structures. WPAs can be used to establish minimum criteria for Greenspace and tree coverage, thus preserving and protecting important water supply areas.

The state of Georgia has already established a goal of creating a program to protect 20% Greenspace within each watershed in the Atlanta region. This proposal is consistent with that program; it may expedite the attainment of 20% Greenspace by converting property to Greenspace. The selection of appropriate properties should be undertaken in conjunction with those committees implementing the Greenspace program.

Many communities may be concerned that the establishment of WPAs (and their associated Greenspaces) may result in lost economic benefits. Affected counties may lose tax revenues, property owners may see lower property values, and business may see lower activity.

Landowners could be compensated using funds from stormwater fees. Purchase of conservation easements in WPAs using stormwater fees could be a readily implemented method for watershed conservation. TSRs provide an additional compensation tool - the economic costs associated with water-supply protection would be offset by purchases of stormwater rights.

CONCLUSIONS

Options for creating a sustainable relationship between land uses, water resources, and economic growth are

diminishing rapidly. Elevated stormflows, in conjunction with increased surface loading rates, pose substantial risks to human and ecologic health due to potentially harmful concentrations of metals, organic contaminants, nutrients, toxic metals, sediments, pathogens, and thermal pollution in downstream waterbodies.

The costs associated with stormwater control highlight the need for thoughtful and effective stormwater protection measures that can reduce such expenditures while still meeting federal requirements and allowing counties and municipalities to meet their fiduciary responsibilities.

The 10-25 Plan, proposed here, is designed to improve environmental quality while enabling continued growth and retaining autonomy at the local level. Our proposal enables the Metro Water District to *level the playing field* for all municipalities. The Metro Water District would be responsible for determining the levels and rates of increase of these fees, and local jurisdictions could use the fees based on prioritized needs.

The Metro Water District may be best served by a district-wide approach to using collected fees rather than a system which constrains fee use to the jurisdiction in which they are collected. In many cases, use of fees to protect areas upstream of a municipality can protect the drinking water supply.

While local jurisdictions may lose direct autonomy over the expenditure of fees, the structure of the Metro Water District allows procedures to be emplaced that allocates these resources to best protect those jurisdictions from a watershed perspective. In this way, fees will be more effectively allocated to maximize protection of local water systems.

Municipalities can prioritize projects in accordance with local and regional plans; some may choose to allocate these fees each year to buying Greenspace. For others, it may be cost effective to provide incentives to businesses to convert parking lots into smaller surface area parking decks or otherwise decrease the impact they are having on subsurface storage and streams.

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LITERATURE CITED

- Arnold, C. and J. Gibbons, 1996. Impervious surface coverage: The emergence of a key environmental indicator. *J Am Plan Assoc*, 62(2):243-258.
- Horner, R., C. May, E. Livingston, and J. Maxted, 1999. Impervious Cover, Aquatic Community Health, and Stormwater BMPs: Is There a Relationship? *Sixth Biennial Stormwater Res & Watershed Mgmt Conf.*
- Rose, S. and N.E. Peters, 2001. Effects of urbanization on streamflow in the Atlanta area (Georgia, USA): A comparative hydrological approach. *Hydro. Processes*, 14:1441-1457.
- Schueler, T. 1994. The importance of imperviousness. *Watershed Protection Techniques*, 1(3):100-111.
- Schueler, T. 1996. Crafting better urban watershed protection plans. *Watershed Protection Techniques*, 2(2):329-337.