Article 30

Feature article from Watershed Protection Techniques. 2(4): 469-481

The Economics of Watershed Protection

Watershed protection may be a fine idea, but how much does it cost? How does it change the bottom line for the region, the development community, landowners and residents alike? This question is increasingly being posed to those advocating better watershed protection. In this article, we review economic research on the costs and benefits of employing watershed management tools and tally the score for the region, the municipality, the developer and the property owner.

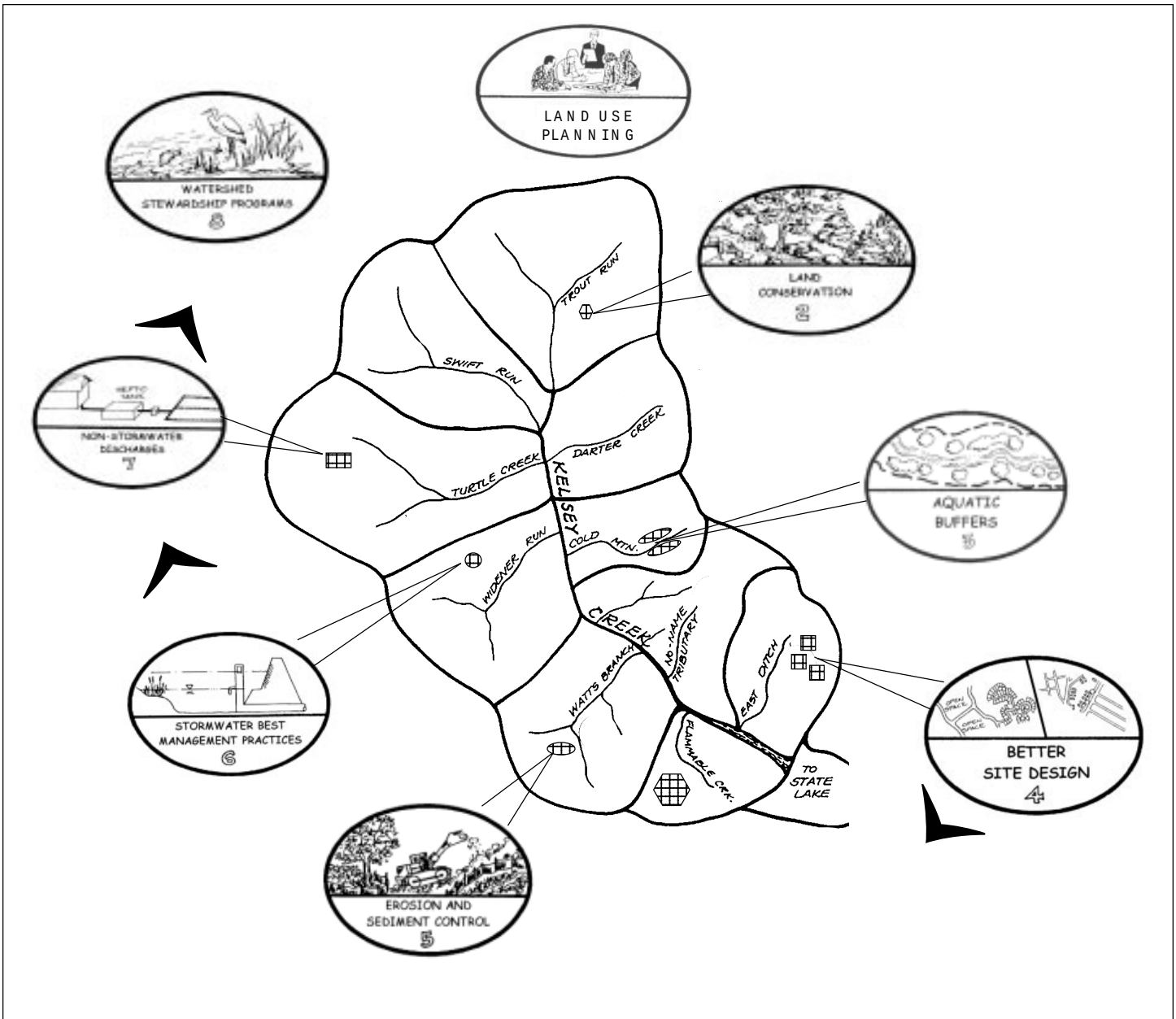


Figure 1: Eight Tools for Watershed Protection

Economic Benefits of Watershed Protection Tools

Watershed development does not have to be synonymous with the degradation of aquatic resources. When new growth is managed in a watershed context, homes and businesses can be located and designed to have the smallest possible impact on streams, lakes, wetlands and estuaries. In the watershed protection approach outlined here, communities can apply eight basic tools that guide where and how new development occurs (see Figure 1).

The watershed protection tools highlighted in this article are designed to protect water quality while increasing the value of existing and developable land. If used correctly, these tools can protect the rights of individual property owners as well as those of the entire community.

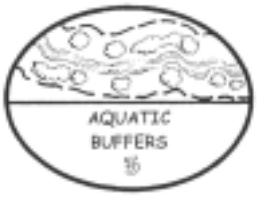
Many players in the local economy perceive that watershed protection can be costly, burdensome and potentially a threat to economic vitality. Others counter that watershed protection is inextricably linked to a healthy economy. Below we review some of the actual research on the economic costs and benefits associated with each of the eight watershed protection tools. While economic research on many of the tools is rather sparse, much of the evidence indicates that these tools can have a positive or at least neutral economic effect, when applied properly.

The first and most important tool is local land use planning, a process for identifying key watershed uses, and then directing the appropriate level of new growth to those subwatersheds that can best afford and accommodate it (Schueler, 1995). Land use planning involves assessing stream conditions and developing strategies to maintain or restore their condition. It directs proposed development to the least sensitive area and attempts to control the amount and location of impervious cover in a watershed. Some subwatersheds are designated as growth areas, while others are partly or fully protected from future development. Many communities wonder about the effect of such broad-based land use planning on property values and the local tax base. Recent studies, however, suggest that the effect of watershed planning is largely positive:

- Beaton (1988) examined land values before and after the Maryland Critical Area and New Jersey Pinelands land use regulations were imposed. He found that the regulations had no impact on the volume of construction activity, and had slightly improved the local tax base. This was because the value of developed land within the regulated area had climbed from five to 17%, and the value of vacant land had increased by five to 25%. As Beaton notes, "Residents in both regions benefited from the knowledge that public actions were taken to protect the environmental amenity in which they had already invested." Since both developed and undeveloped land had grown in value, owners received a significant premium when they sold their property.
- Land use plans that retain open space, rural landscapes, and recreational opportunities contribute to the quality of a community or region. A survey of chief executive officers has ranked quality of life as the third most important factor in locating a new business (National Park Service, 1992). As regional economies become ever more competitive, a high quality-of-life ranking can provide a critical edge in attracting new business.
- Citizens also rank protection of their water resources quite highly. A North Carolina survey showed a strong preference for spending more public funds on environmental protection than for highway construction, welfare, or economic development. Only crime and education ranked as higher spending priorities among citizens (Hoban and Clifford, 1992).
- However, watershed planning is not without costs. Effective watershed planing requires a careful local investment in technical studies, monitoring, coordination and outreach. As Brown (1996) notes, a community can expend several hundred thousand dollars on a watershed study to obtain the scientific data to justify land use decisions. Further, the long-term cost to fully implement a watershed plan can be significant for many local governments.

Communities have repeatedly found that property adjacent to protected wetlands, floodplains, shorelines, and forests constitutes an excellent location for development. (U.S. EPA, 1995). A sense of place is instilled by the presence of water, forest and natural areas and this preference is expressed in a greater willingness to pay to live near these habitats. Examples include the following:

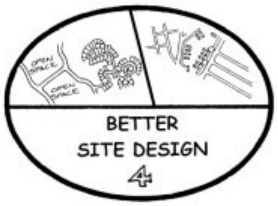
- Two regional economic surveys document that conserving forests on residential and commercial sites can enhance property values by an average of six to 15% and increases the rate at which units are sold or leased (Morales, 1980; Weyerhauser, 1989). An Atlanta study also showed that the presence of trees and natural areas measurably increased the residential property tax base (Anderson and Cordell, 1982). In addition, urban forests boost property values by reducing irritating noise levels and screening adjacent land uses. The absence of trees increases dust levels by four to 100 times (Nelson, 1985).
- Conserving trees also saves money on energy bills and treatment of runoff. Studies by the American Forest Association have shown that homes and businesses that retain trees save 20 to 25% in their energy bills for heating and cooling, compared to homes where trees are cleared. The urban forest canopy also helps to reduce the volume of stormwater runoff. A modeling study by Henson and Rowntree (1988) reported that stormwater decreased by 17% due to forest cover in a Utah development during a typical one-inch rainstorm.
- Coastal wetland areas contribute to the local economy through recreation, fishing and flood protection. Various economists have calculated that each acre of coastal wetland contributes from $800 to $9,000 to the local economy (Kirby, 1993).



A shoreline or creek buffer can create many market and non-market benefits for a community, particularly if they are managed as a greenway:

- An increase in the value of adjacent property. For example, housing prices were found to be 32% higher if they were located next to a greenbelt buffer in Colorado (Correl *et al.*, 1978). Nationally, buffers were thought to have a positive or neutral impact on adjacent property values in 32 out of 39 communities surveyed (Schueler, 1995).
- Forested shoreline and stream buffers situated on the flat soils of the coastal plain have been found to be effective in removing sediment, nutrients and bacteria from stormwater runoff and septic system effluent in a wide variety of rural and agricultural settings along the East Coast (Desbonnet *et al.*, 1994).
- Buffers provide a critical "right of way" for streams during large floods and storms. When buffers contain the entire 100-year floodplain, they are an extremely cost-effective form of flood damage avoidance for both communities and individual property owners. As an example, a national study of 10 programs that diverted development away from flood-prone areas found that land next to protected floodplains had increased in value by an average of $10,427 per acre (Burby, 1988).
- Homes situated near seven California stream restoration projects had a three to 13% higher property value than similar homes located on unrestored streams (Streiner and Loomis, 1996). Most of the perceived value of the restored stream was due to the enhanced buffer, habitat, and recreation afforded by the restoration.
- In addition, buffers can sharply reduce the number of drainage complaints received by local public works departments and they are often an effective means to mitigate or even prevent shoreline erosion.
- A shoreline or creek buffer can help protect valuable wildlife habitat. For example, each mile of buffer protects 12 acres of habitat along shorelines and 25 acres along creeks (Schueler, 1995). A continuous buffer provides a wildlife corridor which is of particular value in protecting amphibian and waterfowl populations, as well as coastal fish spawning and nursery areas. Such protection has an economic payoff as well. For example, Adams (1994) reports that nearly 60% of suburban residents actively engage in wildlife watching near their homes, and a majority are willing to pay a premium for homes located in a setting that attracts wildlife.
- Corporate land owners can save between $270 to $640 per acre in annual mowing and maintenance costs when open lands are managed as a natural buffer area rather than turf (Wildlife Habitat Enhancement Council, 1992).
- When managed as a "greenway," stream buffers can expand recreational opportunities and increase the value of adjacent parcels (Flink and Searns, 1993). Several studies have shown that greenway parks increase the value of homes adjacent to them. Pennypack Park in Philadelphia is credited with a 33% increase to the value of nearby property. A net increase of more than $3.3 million in real estate value is attributed to the park (Chesapeake Bay Foundation, 1996a). A greenway in Boulder, Colorado, was found to have increased aggregate property values by $5.4 million, resulting in $500,000 of additional tax revenue per year (Chesapeake Bay Foundation, 1996a).

- Effective shoreline buffers can increase the value of urban lake property. For example, a recent study of Maine lakes found that water clarity was directly related to property values. Specifically, a three-foot improvement in water clarity resulted in $11 to $200 more per foot of shoreline property, potentially generating millions of dollars in increased value per lake (Michael *et al.*, 1996).



Better site design involves approaching new development with the goals of reducing impervious cover and increasing the conservation of natural areas. One way to accomplish this is through cluster development, which minimizes lot sizes within a compact developed portion of a property while leaving the remaining portion prominently open. Housing can still consist of detached single family homes as well as multi-family housing or a mix of both. Cluster development creates protected open space that provides many market and non-market benefits. For example, some communities have found that cluster development:

- Can reduce the capital cost of subdivision development by 10 to 33%, primarily by reducing the length of the infrastructure needed to serve the development (NAHB, 1986; Maryland Office of Planning, 1989; Schueler, 1995).
- Typically keeps from 40 to 80% of total site area in permanent community open space. Much of the open space is managed as natural area, which often increases the future value of residential property in comparison to low-density subdivisions. This premium has ranged from five to 32% in communities in the Northeastern United States. In Massachusetts, cluster developments were found to appreciate 12% faster than conventional subdivisions over a 20-year period (Lacey and Arendt, 1990). In Howard County, Maryland, a cluster development with an average lot size of one acre had the same market value as a conventional subdivision with one to five acre lots (Legg Mason, 1990).
- Can reduce the need to clear and grade 35 to 60% of total site area. Since the total cost to clear, grade and install erosion control practices can range up to $5,000 per acre, reduced clearing can be a significant cost savings to builders (Schueler, 1995).
- Can reserve up to 15% of the site for active or passive recreation. When carefully designed, the recreation space can promote better pedestrian movement, a stronger sense of community space and a park-like setting. Numerous studies have confirmed that developments situated near trails or parks sell for a higher price than more distant homes.
- Provides a developer some "compensation" for lots that would otherwise have been lost due to wetland, floodplain or other requirements. This, in turn, reduces the pressure to encroach on stream buffers and natural areas.
- Can reduce site impervious cover from 10 to 50% (depending on the original lot size and layout), thereby lowering the cost for both stormwater conveyance and treatment. This cost savings can be considerable, as the cost to treat the quality and quantity of stormwater from a single impervious acre can range from $2,000 to $50,000 (see article 68). In addition, the ample open spaces within a cluster development provide a greater range of locations for more cost-effective stormwater runoff practices.

Some indication of the potential savings associated with "open space" or cluster development are shown in the Remlik Hall Farm example produced by Land Ethics, Inc. for the Chesapeake Bay Foundation (1996b). Cost estimates were derived for two development scenarios that result in equivalent yield to the developer (see Table 1). In the conventional scenario, the farm is subdivided into 84 large-lot units, whereas in the open-space scenario 52 higher-end units are located on smaller lots in three clusters. Over 85% of the site is retained in open space, as farmland, forest or wetland as illustrated in Figure 2.

The authors compute net development savings of over $600,000 for this 490-acre cluster development (or about 50% lower costs than the conventional scenario). These large savings in development infrastructure including engineering, sewage and water, and road construction costs certainly contribute to a better bottom line. In addition, Arendt (1994) maintains that open space units sell both more rapidly and at a premium, thus increasing cash flow which is always a prime concern to the developer.

Reducing the amount of impervious cover created by subdivisions and parking lots at developments can lead to savings for municipalities and developers. Impervious cover can be minimized by modifying local subdivision codes to allow narrower or shorter roads, smaller parking lots, shorter driveways and smaller turnarounds. These tools make both economic and environmental sense. Infrastructure—roads, sidewalks, storm sewers, utilities, street trees—normally constitute over half the total cost of subdivision development.

Table 1: Remlik Hall Farm Example: Costs, Land Cover, and Pollution Associated With Two Plans (Land Ethics, Inc.)

Development Costs

	Scenario A Conventional Plan		Scenario B Cluster Plan	
1. Engineering Costs, (boundary survey, topo, road design, plans, monumentation)		$79,600		$39,800
2. Road Construction Costs	20,250 linear ft.	$1,012,500	9,750 linear ft.	$487,500
3. Sewage and Water (permit fees and design only)	Individual septic and wells	$25,200		$13,200
4. Contingencies		$111,730		$54,050
GRAND TOTAL		$1,229,030		$594,550

Land Cover and Storm-water Pollutant Estimate

Total Site Area = 490.15 acres		
Total Developed Land	287.41 acres (58.6%)	69.41 acres (14.2%)
Roads & Driveway	19.72 acres	11.75 acres
Turf	261.09 acres	54.04 acres
Buildings	6.60 acres	3.92 acres
Total Undeveloped Land	202.74 acres (41.4%)	420.64 acres (85.8%)
Forest	117.55 acres	133.01 acres
Wetlands	11.46 acres	11.46 acres
Total Impervious Cover	5.4%	3.7%
Total Nitrogen *(lbs. per year)*	2,534 lbs./yr	1482 lbs./yr
Phosphorous *(lbs. per year)*	329 lbs./yr	192 lbs./yr

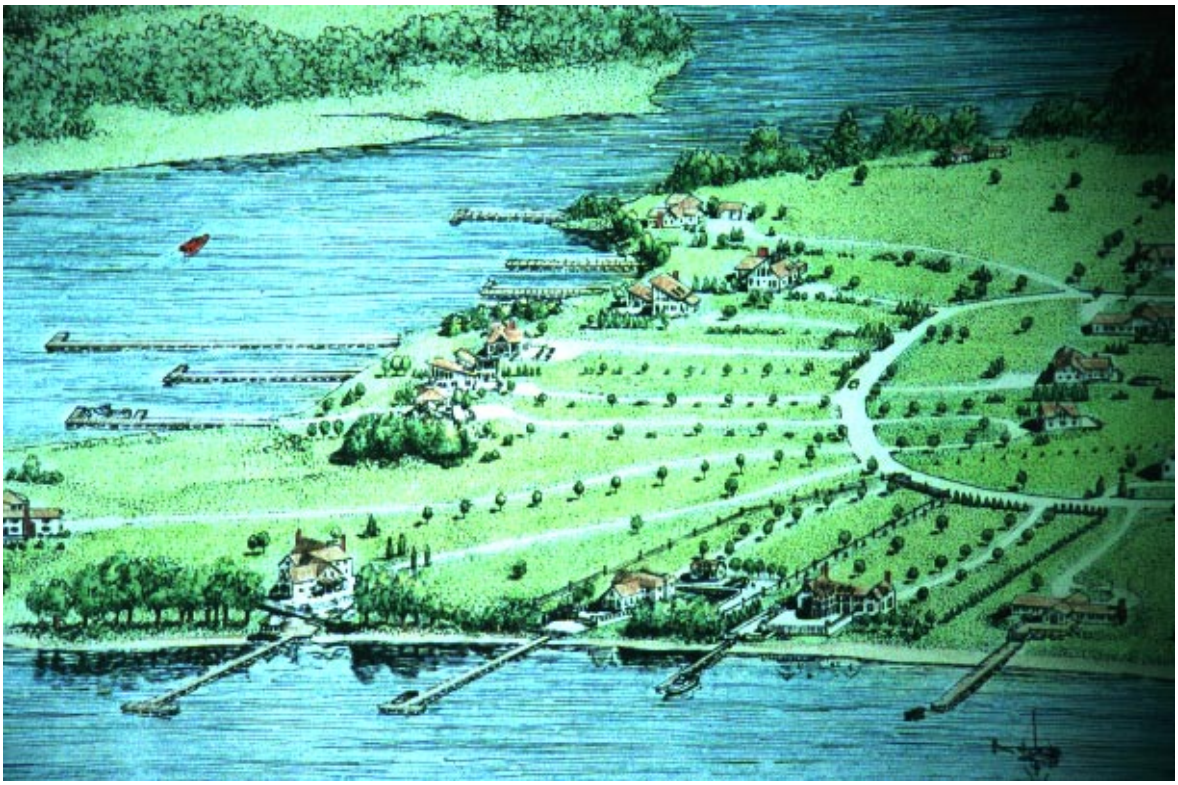
(CH2M-Hill, 1993). Much of the infrastructure creates impervious surfaces. Thus, builders can realize significant cost savings by minimizing impervious cover (Table 2). Some of the typical savings include the following:

- $1,100 for each parking space that is eliminated in a commercial parking lot, with a lifetime savings in the range of $5,000-$7,000 per space when future parking lot maintenance is considered
- $150 for each linear foot of road that is shortened (pavement, curb and gutter, and storm sewer)
- $25 to $50 for each linear foot of roadway that is narrowed
- $10 for each linear foot of sidewalk that is eliminated

In addition to these direct costs savings, developers will realize indirect savings. For example, costs for stormwater treatment and conveyance are a direct function of the amount of impervious cover (see article 68). Thus, for each unit of impervious cover that is reduced, a developer can expect a proportionately smaller cost for stormwater treatment.

Current state and local requirements for erosion and sediment control (ESC) often do increase the cost of development. On a typical site, the cost to install and maintain erosion and sediment control can average $800 to $1,500 per cleared acre per year, depending on the

Conventional Development Plan (A)



Cluster Development Plan (B)

Figure 2: Illustrations of the Remlik Hall Farm Case Study
(Sources: Land Ethics, Inc. and Dodson & Associates)

duration of construction and the site conditions (SMBIA, 1990; Paterson *et al*., 1993).

Application of other watershed protection tools, however, can help reduce the total cost for ESC control at a construction site. Forest conservation, buffers and clustering all can sharply reduce the amount of clearing needed at a site, thereby reducing area that must be controlled by ESC practices.

ESC controls also provide direct and indirect benefits to both the builder and the adjacent property owner. By keeping soil on the site, a contractor needs to spend less time and labor re-grading the site to meet final plan elevations, and less effort stabilizing eroded slopes. Careful phasing of construction within subdivisions also often leads to economies over the entire construction process (see article 54).

Table 2: The Unit Cost of Subdivision Development
(Source: SMBIA 1987 and others, as published in Schueler 1995)

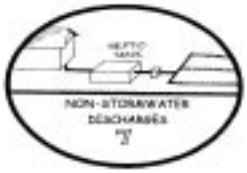
Subdivision Improvement	Unit Costs
Roads, Grading	$22.00 per linear foot
Roads, Paving (26 feet width)	$71.50 per linear foot
Roads, Curb and Gutter	$12.50 per linear foot
Sidewalks (4 feet wide)	$10.00 per linear foot
Storm Sewer (24 inch)	$23.50 per linear foot
Clearing (forest)	$4,000 per acre
Driveway Aprons	$500 per apron
Sediment Control	$800 per acre
Stormwater Management	$300 per acre (variable)
Water/Sewer	$5,000 per lot (variable)
Well/Septic	$5,000 per lot (variable)
Street Lights	$2.00 per linear foot
Street Trees	$2.50 per linear foot

Stormwater management practices, which include stormwater ponds, wetlands, filtering, infiltration, and swale systems, are among the most expensive watershed protection tools. Stormwater practices are designed to promote recharge, remove pollutants, prevent streambank erosion, and control downstream flooding. Despite their high construction and maintenance costs, stormwater practices can confer several tangible economic benefits, as the following studies show:

- The cost of designing and constructing stormwater practices can be very substantial. The most recent cost study indicates the cost of treating the quality and quantity of stormwater runoff ranges from $2,000 to $50,000 per impervious acre (see article 68). The construction costs do not include cost of land used for stormwater. Stormwater practice costs are greatest for small development sites (less than acres), but drop rapidly at larger sites. In general, about a third of every dollar spent on stormwater practice construction is used for quality control, with the rest devoted for flood control.
- Stormwater management can also be beneficial for developers, since stormwater ponds and wetlands create a waterfront effect. For example, U.S. EPA (1995) recently analyzed twenty real estate studies across the U.S. and found that developers could charge a per lot premium of up to $10,000 for homes situated next to well-designed stormwater ponds and wetlands. In addition, EPA found that office parks and apartments next to well-designed stormwater practices could be leased or rented at a considerable premium (and often at a much faster rate).
- In a comparison of home prices in Minnesota, sale prices were nearly one-third higher for homes that had a view of a stormwater wetland compared to homes without any "waterfront" influence. Indeed, the homes near the stormwater wetland sold for prices that were nearly identical to those homes bordering a high quality urban lake (Clean Water Partnership, 1997).
- Not all stormwater practices provide a premium. For example, Dinovo (1995) surveyed the preferences of Illinois residents about living or locating next to dry ponds, and found most residents would not pay a premium to live next to a dry pond, and in some cases expected to pay less for such a lot. The study confirmed that wet ponds command a considerable premium and they even scored higher than natural areas, golf courses, and parks in some location decisions (see article 84).
- In addition, some stormwater practices, such as grassed swales and bioretention areas, actually are less expensive to construct than enclosed storm drain systems, and provide better environmental results. Liptan and Kinsella-Brown (1996) documented residential and commercial case studies where the use of bioretention and swales reduced the size and cost of conventional storm drains needed to meet local drainage and stormwater management requirements. The more natural drainage system eliminated the need for costly manholes, pipes, trenches and catchbasins, while removing pollutants at the same time. Total re-

ported savings for the three projects ranged from $10,000 to $200,000.

- Stormwater practices must be maintained, and that cost burden falls on landowners or local government. Over a 20 to 25 year period, the full cost to maintain a stormwater practice is roughly equal to its initial construction costs (Wiegand *et al.*, 1986). Few property owners and homeowner associations are fully aware of the magnitude of stormwater maintenance costs, and most fail to regularly perform routine and non-routine maintenance tasks. It is likely that performance and longevity of many stormwater practices will decline without adequate maintenance. Therefore, local governments need to evaluate how the future maintenance bill will be paid and who will pay it.



In many rural watersheds, new development occurs outside of water and sewer service areas, which means that wastewater must be treated on the site, usually by a septic system. To treat wastewater, septic systems must have appropriate drainage area and soil to function properly. Costs associated with installing septic systems—and correcting system failures—are as follows:

- The average cost of constructing a conventional septic system at a single family home situated on a large lot is around $4,500 (U.S. EPA, 1993)—approximately equal to the unit cost of municipal wastewater (Table 2). The cost of more innovative septic systems (that have a higher nutrient removal rate, lower failure rates, or that can perform on poor soils) are 25 to 75% greater than conventional systems, with somewhat higher maintenance costs as well (see article 123).
- The cost to maintain a properly functioning septic system on an individual lot is not inconsequential. For example, the cost to inspect a septic system ranges from $50 to $150 per visit, and each pumpout costs about $150 to $250. The recommended pumpout frequency ranges from two to five years for a standard household tank. Over a decade, the total costs of maintaining a septic system can run from $1,000 to $3,000 (Ohrel, 1995).
- There are also major costs to landowners when septic systems fail. A failed or failing septic system can decrease property values, delay the issuance of building permits, or hold up the purchase settlement (NSFC, 1995). In the event a septic system fails, homeowners can expect to pay from $3,000 to $10,000 for replacement.

After development occurs, communities still need to invest in watershed management programs. This tool is used to educate residents and businesses about the daily role they play in protecting the quality of their watershed. Thus, many communities now invest in programs of watershed education, public participation, watershed management, monitoring, inspection of treatment systems, low input lawn care, household hazardous waste collection, or industrial and commercial pollution prevention programs. The common theme running through each program is education.

The responsibility for ongoing watershed management programs is borne by local government, although many are now employing stormwater utilities to partially finance these programs (for a review of trends in stormwater utilities, see article 69). Nationally, the average residential stormwater utility fee is about 30 dollars per year, of which less than 75 cents is spent on watershed education.

The Balance Sheet: Watershed Protection Tools

The various costs and benefits associated with the nine watershed protection tools are summarized in the "balance sheet" shown in Table 3. Different costs and benefits accrue depending on whether one is a developer, property owner, community or local government. Taken as a package, most of the players tend to make out pretty well, but there are some key differences. For example, most watershed protection tools benefit landowners, in terms of appreciation of property values as long as they are in a developable area. This benefit is offset to some degree by real costs for maintenance of treatment systems as well as fees that may be charged for stormwater utilities.

Some watershed protection tools have the potential to save developers money, through lot premiums, greater marketability, and lower construction costs. At the same time, a developer has to pay out-of-pocket for stormwater and sediment control, as well as consultant fees to navigate through the watershed protection maze. As might be expected, the community at large gets the greatest overall benefit associated with watershed protection, and appears to bear the least cost (although they may have to pay more for housing).

The only consistent financial "loser" in the watershed protection balance sheet is local government. Local government must provide at least some staff and technical resources to guide, review, inspect, monitor, enforce and manage each watershed protection tool.

Even hiring one additional staff person can be a daunting challenge in this era of austere government, particularly if the person is even dimly linked to the possibility of more review, regulation or red-tape. Many players in the local economy are justifiably concerned about the economic consequences created by watershed protection. Thus, despite its long-term benefits, watershed protection is both fiscally and politically challenging for local governments. How, then, do communities craft watershed protection programs that can achieve the broad and deep acceptance needed to overcome these challenges? Successful communities have found it important to do the following:

- Invest early in watershed education and outreach
- Designate a single agency to champion watershed protection and play a role in the development process
- Employ a unified and streamlined development review process

Table 3: Balance Sheet for Watershed Protection

(–) negative economic consequence (+) positive economic or environmental impact

Watershed Protection Tools	Developer/Builder	Adjacent Property Owner	Community	Local Government
1. Watershed Planning and Zoning	(–) cost of land (–) locational constraints	(+) property value	(+) business attraction (+) protection from adverse uses	(–) staff and budget resources (+) reduced "clean up"
2. Protect Sensitive Areas	(+) natural area premium (–) permitting costs (–) locational constraints	(+) property value	(+) habitat (+) fisheries	(–) staff resources (+) reduced "clean up" costs (+) lower cost of services
3. Establish Buffer Network	(+) buffer premium (–) locational constraints	(+) property value	(+) flooding risk (+) wildlife (+) greenway (+) trails	(–) staff resources (+) fewer drainage complaints
4. Cluster and Open Space Development	(+) construction costs (+) marketability (+) no lost lots	(+) property value (–) HOA fees	(+) recreation (+) green space (+) natural area preservation	(–) staff resources (+) lower cost of services
5. Narrow Streets and Smaller Parking Lots	(+) reduced construction cost	(+) property value (–) parking	(+) better sense of place (+) pedestrian friendly	(–) staff resources
6. Erosion and Sediment Control	(–) higher cost (+) savings in cleaning/ grading	(+) trees saved increase value (+) no off-site sediment	(+) water quality (+) tree conservation	(–) staff resources (+) reduced complaints from downstreamers
7. Stormwater Best Management Practices	(–) higher costs (+) pond/wetland premium	(–) maintenance (+) waterfront effect (if done right)	(+) protection of water supply (+) stream protection	(–) staff resources (+) reduced waterbody programs/problems
8. Treat Septic System Effluent	(–) higher design and engineering costs	(–) clean out costs	(+) protection of water supply	(–) staff resources
9. Ongoing Watershed Management	no impact	(–) annual fee for utility (+) continued healthy environment	(–) annual fee (+) involvement in watershed services	(–) staff resources
ECONOMIC TREND	**MIXED**	**POSITIVE**	**POSITIVE**	**NEGATIVE**

- Develop simple and practical performance criteria
- Include all stakeholders in a public process to define the scope of watershed protection tools
- Be responsive to the needs of the development community for fair and timely review and "common-sense" requirements
- Provide incentives and remedies that protect the economic interests of existing landowners
- Continually tout the economic and environmental benefits that are expected from watershed protection
- Institute a dedicated funding source to support watershed protection such as a stormwater utility

The central role of local government leadership in watershed protection cannot be overstated, nor can the budget implications be discounted.

Summary

The premise that carefully-managed watershed protection tools can have a balanced, positive effect on the local economy is generally supported by the economic research to date. It must, however, be acknowledged that our understanding of the economics of watershed protection is fragmented, and we know more about the parts than the whole. More economic research is urgently needed on the market and non-market benefits of an overall watershed protection program.

At first glance, it seems futile to calculate the intrinsic economic value of a quality stream, a productive cove, a clear lake, or a forested floodplain. Calculating the "true" value of a quality watershed, however it might be defined, seems an even more daunting task. Most economists would privately agree this can probably never be done. What is interesting about urban watersheds, however, is that society measures the value it places on these resources every day, in terms of property values, real estate premiums, lease-up rates, stormwater utility fees, construction costs and volunteer hours donated. While we may never know the true value of a stream, the research reviewed in this article clearly suggests that society does not value them lightly.

The timeless (and tired) real estate adage "location, location, and location" underscores the importance of how people value land. Research profiled here suggests that many of us prefer to locate next to forests, wetlands, streams and water features. More importantly, even those members of the community who do not live next to these features, still recognize the important role that they play in the quality of the environment and in their lives. Harnessing this sense of place is perhaps the most important element of watershed protection programs.

References

Adams, L. 1994. *Urban Wildlife Habitats--A Landscape Perspective.* University of Minneapolis Press. Minneapolis, MN. 175 pp.

Anderson, L.M. and Cordell, H.K., "Residential Property Values Improved by Landscaping with Trees." *Southern Journal of Applied Forestry* pp. 162-166.

Arendt, R. 1994. *Designing Open Space Subdivisions: a Practical Step by Step Approach.* Natural Lands Trust. Appendix E. Medic, PA. 150 pp.

Beaton, W. P. 1988. *The Cost of Government Regulations. Volume 2. A Baseline Study for the Chesapeake Bay Critical Area.* Chesapeake Bay Critical Area Commission. Annapolis, MD. 216 pp.

Beaton, W.P. 1991. "The Impact of Regional Land Use Controls on Property Values: the Case of the New Jersey Pinelands." *Land Economics* 67 (2): 172-94.

Beaton, W. P. and M. Pollock. 1992. "Economic Impact of Growth Management Policies Surrounding the Chesapeake Bay." *Land Economics* 68 (4): 434-53.

Brown, W. 1996. "Toward a Balanced Monitoring Budget." *Watershed Protection Techniques* 2(1): 338-344.

Burby, R. 1988. *Cities Under Water: A Comparative Evaluation of Ten Cities' Efforts to Manage Floodplain Land Use.* Institute of Behavioral Science #6. Boulder, CO. 250 pp.

Chesapeake Bay Foundation. 1996a. *A Dollars and Sense Partnership: Economic Development and Environmental Protection.* Chesapeake Bay Foundation. Annapolis, MD. 21 pp.

Chesapeake Bay Foundation. 1996b. *A Better Way to Grow: for More Livable Communities and a Healthier Chesapeake Bay.* Chesapeake Bay Foundation, Lands Program. Annapolis, MD. 32 pp.

CH2M-Hill, 1993. *Costs of Providing Government Services to Alternative Residential Patterns. Committee on Population Growth and Development.* U.S. EPA Chesapeake Bay Program. Annapolis, MD. 168 pp.

Clean Water Partnership. 1996. *Wetlands, Water Quality and Property Values.* Chain of Lakes brochure.

Correll, Mark R., Jane H. Lillydahl and Larry D. Singell, 1978. "The Effects of Greenbelts on Residential Property Values: Some Findings on the Political Economy of Open Space." *Land Economics* 54(2).

Desbonnet, A, P. Pogue, V. Lee and N. Wolff. 1994. *Vegetated Buffers in the Coastal Zone: A Summary Review and Bibliography.* Coastal Resources Center, University of Rhode Island. Providence, Rhode Island. 72 pp.

Protecting Property Rights and the Watershed

When a community applies some watershed protection tools, it faces conflict over the rights of the community versus the rights of private property owners. However, a well-crafted watershed protection program protects the rights of all members of the community, as well as the value of their land.

As noted earlier, many watershed protection tools generally have either an economically neutral effect on property value or increase it. For example, open space, forest conservation areas, creek and shoreline buffers and stormwater ponds all maintain the equity value of a parcel since they increase the value of developed properties.

The enhanced effect on land value is meaningless, however, if a property lies entirely within a protection zone and cannot be developed. For example, Holway and Burby (1990) found a sharp drop in the value of wetland and floodplain land when development was restricted. Similarly, Wood (1992) found that conservation easements that essentially prohibit any development or active management retain only 10 to 36% of their prior land value. Beaton (1991) reported that the value of undeveloped land in the most restrictive areas of the New Jersey Pinelands dipped slightly, but there were no wipeouts.

Fortunately, local governments have a number of techniques that can lessen the impact of protection zones on property owners. These include:

- *Transferable development rights* are a tool that achieve some of the same goals as conservation easements, in that another landowner may purchase the rights to develop a property from the owner. When the land is sold or inherited, it retains the prohibition against development. Several useful guides on how to create a TDR program to protect the rural landscape have been developed by Montgomery County, Pennsylvania (1995) and Montgomery County, Maryland (1990).
- *Clustering* allows the same number and type of lots as under existing zoning on a given parcel of land (e.g., single family detached homes), so potentially no equity value is lost. Cluster ordinances require that the total number of allowable lots be clustered on one portion of the entire parcel. Sensitive areas, buffers, and stormwater facilities are situated on the remaining undisturbed open space.
- *Density compensation* grants the landowner a credit for additional density elsewhere on the site, in compensation for developable land that has been lost due to a buffer or natural area requirement. Credits are then granted if more than 5% of developable land is lost, based on a sliding scale (Schueler 1995).
- *Voluntary conservation easements* protect sensitive areas and buffers with a mutually negotiated perpetual conservation easement that conditions the use and development of the land. The local government then taxes the protected land at a much lower rate, giving the landowner a lower property tax burden. There are also significant federal tax benefits (see Diehl and Barret, 1988).
- *Buffer and lot averaging* allows buffer and lot lines to be determined on a average rather than a fixed basis. This added flexibility allows designers to work around existing structures, and environmentally sensitive areas.

Other techniques to consider to protect property rights include grandfathering, traditional use exemptions, and a fair and timely appeals procedure (see also RMC, 1992). Kelly *et al.* (1996) have prepared a useful guide for planners to use in response to concerns about takings.

FInally, it is important to clearly frame each watershed protection tool within the compelling public safety, welfare, or environmental benefits that it provides to the community at large, so that the partial regulation of land use can be legally justified. For example, stormwater and erosion control requirements protect downstream properties from flooding and sediment damages (and claims) arising from upstream activity.

Diehl, J. and T. Barret. 1988. *Conservation Easement Hamper*. The Land Trust Alliance. Trust for Public Land. Alexandria, VA.

Dinovo, C. E. 1995. "Stormwater Detention Basins and Residential Locational Decisions." *Water Resources Bulletin* 31(3): 515-521.

Ebenreck, S. 1988. "Measuring the Value of Trees." *American Forest* 4(7&8): 31-64.

Flink, C., and R. Searns. 1993. *Greenways--A Guide to Planning, Design and Development.* The Conservation Fund. Island Press. Washington, D.C. 338 pp.

Hanson, S., and R. Rowntree. 1988. *Influence of Urban Forest Cover on Radiation, Temperature, and Runoff in the Salt Lake Basin, Utah.* pp. 412-415.

Hoban T., and W. Clifford. 1992. *Public Attitudes Toward Water Quality and Management Alternatives in the Ablemarle-Pamlico Estuary.* APES Report. 89-06. Ablemarle-Pamlico Estuary Program. Raleigh, NC.

Holway, J., and R. Burby, 1990. "The Effects of Floodplain Development Controls on Residential Land Values." *Land Economics* 66: 259-271.

Kelly, E.D., A. L. Strong and D. R. Mandelker. 1996. "The Longer View: Property Rights and Takings." *Journal of the American Planning Association* Winter 1996. In Press.

Kirby, K. 1993. "Wetlands Not Wastelands." *Scenic America Technical Information Series* 1(5): 1-8

Lacey, J., and R. Arendt. 1990. *An Examination of Market Appreciation for Clustered Housing with Permanently Protected Open Space.* Center for Rural Massachusetts, Amherst, MA. 14 pp.

Legg Mason, 1990. *Real Estate Report on Cluster Development in Howard County, MD.* Unpublished report.

Liptan, T. and C. K. Brown. 1996. *A Cost Comparison of Conventional and Water Quality-Based Stormwater Designs.* City of Portland. Bureau of Environmental Services. Portland, OR. 16 pp.

Maryland Office of Planning. 1989. *Environmental and Economic Impacts of Lot Size and Other Development Standards.* Baltimore, MD. 18 pp.

Michael, H. J., K J. Boyle and R. Bouchard. 1996. *Water Quality Affects Property Prices: A Case Study of Selected Maine Lakes.* University of Maine, Maine Agricultural and Forest Experiment Station. Miscellaneous Report 398. 15 pp.

Montgomery County Planning Board. 1990. *Plowing New Ground: Questions and Answers.* Agricultural and Rural Open Space Preservation Program. Montgomery County, MD. 19 pp.

Montgomery County Planning Commission. 1995. *Guidebook for Creating a Municipal TDR Program.* Montgomery County, PA. 62 pp.

Morales, D.J. 1980. "The Contribution of Trees to Residential Property Values." *Journal of Arboriculture* 6(11):301-302.

National Association of Homebuilders (NAHB). 1986. *Cost-Effective Site Planning--Single Family Development.* Washington, D.C. 124 pp.

National Park Service, 1992. *The Economic Impacts of Protecting Rivers, Trails and Greenway Corridors.* National Park Service, Western Regional Office. San Francisco, CA. 100 pp.

National Small Flows Clearinghouse, (NSFC). 1995. "Maintaining Your Septic System--A Guide for Homeowners." *Pipeline* 6(4): 1-B. Septic Systems.

Nelson, W. 1975. "Trees in the Landscape: A Look Beyond the Obvious." *Journal of Arboriculture* 1:121-128.

Ohrel, R. 1995. "Dealing With Septic System Impacts." *Watershed Protection Techniques* 2(1) 269- 27.

Paterson, R., M. Luger, R. Burby, E. Kaiser, H. Malcom and A. Beard 1993. "Costs and Benefits of Urban Erosion and Sediment Control--The North Carolina Experience." *Environmental Management* 17 (2) 167-178.

Resource Management Consultants (RMC). 1992. *Incentives and Their Uses in the Chesapeake Bay Critical Area.* Chesapeake Bay Critical Area Commission. Annapolis, MD. 94 pp.

Schueler, T. 1995. *Site Planning for Urban Stream Protection.* Center for Watershed Protection. Metropolitan Washington Council of Governments. Silver Spring, MD. 222 pp.

Streiner, C. and J. Loomis. 1996. *Estimating the Benefits of Urban Stream Restoration Using the Hedonic Price Method.* Dept. of Agriculture and Resource Economics. Colorado State University. 18 pp.

Suburban Maryland Building Industry Association, (SMBIA). 1990. Unpublished data on the unit cost of residential subdivision development in Suburban, Maryland.

U.S. EPA. 1992. *Stormwater Utilities: Innovative Financing for Stormwater Management.* Office of Policy, Planning and Evaluation. Washington, D.C. 92 pp.

U.S. EPA. 1993. *Guidance for Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters.* Office of Water. EPA 840-B-92-002. Washington, D.C. 740 pp.

U.S. EPA. 1995. *Economic Benefits of Runoff Controls.* Office of Wetlands, Oceans and Watersheds. Washington, D.C. EPA 841-5-95-002. 19 pp.

Weyerhauser Company, 1989. *The Value of Landscaping.* Weyerhauser Nursery Products Division. Tacoma, WA.

Wiegand, C., T. Schueler, W. Chittenden, and D. Jellick. 1986. *Cost of Urban Runoff Quality Controls.* pp. 366-380 *In:* Urban Runoff Quality. Engineering Foundation Conference. ASCE. Henniker, NH, June 23-27. 1986.

Wildlife Habitat Enhancement Council. 1992. *The Economic Benefits of Wildlife Habitat Enhancement on Corporate Lands.* Silver Spring, MD. 22 pp.

Wood, T.C. 1992. "Effect of Conservation Easements on Fair Market Values." Maine Coast Heritage Trust. *Technical Bulletin 104.*