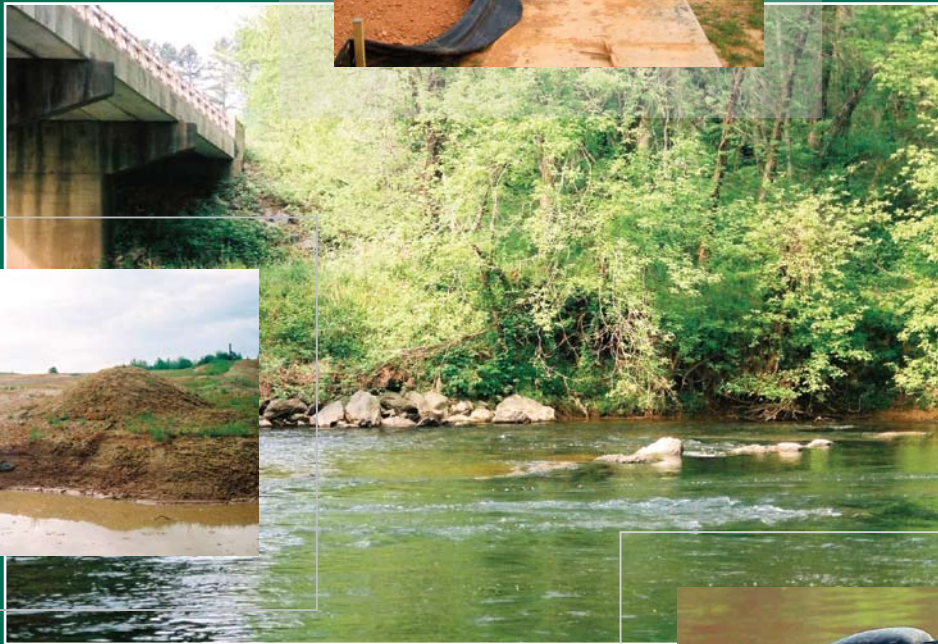


Reducing Runoff from New Development

Recommendations for Fluvanna County

February 2010





The Environmental Law and Conservation Clinic is an academic program of the University of Virginia School of Law. The clinic and its students represent and counsel environmental nonprofits, citizen groups, and other community organizations seeking to protect and restore the environment of Virginia and other parts of the Country. Leon Szeptycki, Director • (434) 924-3825



The Rivanna Conservation Society is a nonprofit organization located in Charlottesville. The mission of the RCS is to develop public support to safeguard the ecological, recreational, cultural, scenic, and historic resources of the Rivanna River Watershed. Robbi Savage, Executive Director • (434) 977-4837

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Sincere appreciation is extended to the Fluvanna County government and Planning Department personnel. Photos were taken by Rebecca Huber and Robbi Savage.

INTRODUCTION

This report was prepared by the Rivanna Conservation Society (RCS) – www.rivannariver.org – with the assistance of the University of Virginia Law School’s Environmental Law and Conservation Clinic and represents one of four reports being published to provide recommendations to help Charlottesville City and Albemarle, Greene, and Fluvanna Counties protect the Rivanna River and its tributaries. The report identifies a number of straightforward and common-sense changes Fluvanna County can make to its ordinances, manuals, and other policies related to site design and building practices in order to reduce pollution from stormwater runoff.

The intent of this report is to identify a few key ways in which Fluvanna County can protect its waters from stormwater pollution, consistent with its vision to be one of the most livable and sustainable communities in the United States. The County’s Comprehensive Plan outlines a means by which Fluvanna can accommodate anticipated growth while sustaining its rural, “small town” character.¹ The Comprehensive Plan includes, in its twenty-year vision, a goal that the County’s rivers be “healthy and full of life.”² The Plan also declares



The Rivanna River is a vital resource for Fluvanna County and must be protected.

that “[t]he James, Rivanna, and Hardware rivers are a critical part of the history and ecology of the county” and expresses the ideal that these rivers should be “healthy, viable rivers with a diversity of aquatic life.”³ Healthy streams and rivers in Fluvanna County can improve quality of life by increasing recreation and preserving a viable water supply.

Fulfilling this vision will be challenging and will rely, in part, on the method of growth management in the County. In the Rivanna Basin, declining water quality is closely related to development and urbanization. At present, a number of rivers and streams flowing within or along the borders of Fluvanna County are listed by the Virginia Department of Environmental

Quality (DEQ) as “impaired waters” under section 303(d) of the Clean Water Act. Approximately fifteen miles of the Rivanna River itself are “impaired” under Virginia’s aquatic life standard. Although DEQ has not yet identified the source of the pollution causing this impairment, violations of this standard are typically associated with sediment pollution, which, in turn, is frequently caused by stormwater runoff. For urbanized portions of the Rivanna system, stormwater runoff has been identified as an important cause of pollution.⁴

Fluvanna County, being largely rural, is in an excellent position to protect its rivers and streams from the effects of stormwater pollution. This, in turn, will move the County closer to the vision in its Comprehensive Plan. In 2009, the volunteer water quality monitoring group StreamWatch issued its stream conditions report summarizing the biological health of the Rivanna River at thirty-five sites throughout the watershed. The report rated the health of these sites on a scale of very good, good, fair, poor, or very poor. Eleven of the thirty-five sites were located in Fluvanna County, and ten received a rating of either good or fair. The

¹ *Fluvanna County 2009 Comprehensive Plan*, page 4.

² *Id.*

³ *Id.* at page 8.

⁴ *Virginia Department of Environmental Quality, Final 2008 305(b)/303(d) Water Quality Assessment Integrated Report*, p. 3.3a-31 (approved by the Environmental Protection Agency on December 18, 2008). Information about impaired waters in Fluvanna County can most easily be retrieved by visiting <http://gisweb.deq.virginia.gov/FactSheets2008/Choose.aspx> and searching for impaired waters in Fluvanna County.

eleventh, a reference site, received a rating of very good. (<http://streamwatch.org/reports>). As a testament to Fluvanna's protection of the Rivanna, 45% of its sites received at least a good rating, as compared with only 34% basin-wide.⁵

Unfortunately, the threat of stormwater runoff to Fluvanna's streams and rivers is likely to increase as the County continues to grow, resulting in the replacement of natural terrain with asphalt, pavement, and buildings. In the 1990s, Fluvanna's population rose over 60%, one of the highest growth figures in the State. In 2000, the population of Fluvanna County was 20,047. Growth projections indicate that the Fluvanna population will exceed 28,000 by 2010 and will approach 40,000 by 2030.⁶ Additionally, nearly half of all homes in Fluvanna County have been built since 1990, suggesting a significant influx of new home owners that will likely continue. Thus, Fluvanna County and the communities within its borders must act now to limit runoff from future development in order to protect the health of its rivers and streams.

While the County must address runoff from many sources – including existing development and agriculture – this report focuses on the urgent issue of limiting runoff from new development. The report addresses issues such as site design and building practices, and in particular how Fluvanna County can promote practices that limit the impervious footprint of and run-off from new development. The report does not address the location of zoning districts; its focus is on how things are built rather than where. Further, it is important to recognize that this report is just one of a number of ongoing efforts to address stormwater pollution. For example, the Department of Conservation and Recreation has recently approved new regulations for the Virginia Stormwater Management Program. Additionally, the Rivanna River Basin Commission (RRBC) is engaged in a multi-year effort to study pollution in the Rivanna watershed from stormwater and other sources. Individually and collectively, these efforts are designed to produce recommendations for a wholesale shift in the way the region approaches stormwater runoff. Accordingly, this report recommends near-term changes that will improve water quality and set the stage for implementation of other recommendations as they are finalized.

It is our hope and expectation that the recommendations in this report and the reports for other localities will be implemented by all jurisdictions in the Rivanna Basin and will thus play an important role in reducing stormwater pollution from new development. By implementing the recommendations now, Fluvanna County can proactively protect the quality of some of its most important natural resources – its rivers and streams.

THE CHALLENGES OF STORMWATER RUNOFF

Stormwater runoff occurs during rainstorms when precipitation that would normally soak into and infiltrate natural ground cover instead collects and flows over paved surfaces and construction sites. As the amount of developed land increases, less rain is absorbed into the ground, thus increasing the volume and speed of stormwater runoff. Scientific study of the problem clearly demonstrates that both urban and agricultural runoff dramatically affect water quality throughout Virginia.⁷ Also, because stormwater runoff moves quickly to streams rather than infiltrating the ground where it falls, it can compromise the recharging of groundwater aquifers.

Stormwater causes pollution in two ways. First, as it grows in *quantity*, it can cause excessive erosion and sedimentation of the waterways into which it flows. In natural and forested conditions, much of the precipitation from rainstorms is absorbed back into the ground where it falls, nourishing plant life and helping to recharge groundwater aquifers. Typically, any excess rainwater will flow slowly over the terrain and eventually empty into nearby streams and rivers. However, this is not the case for urbanized areas. It has been estimated, for

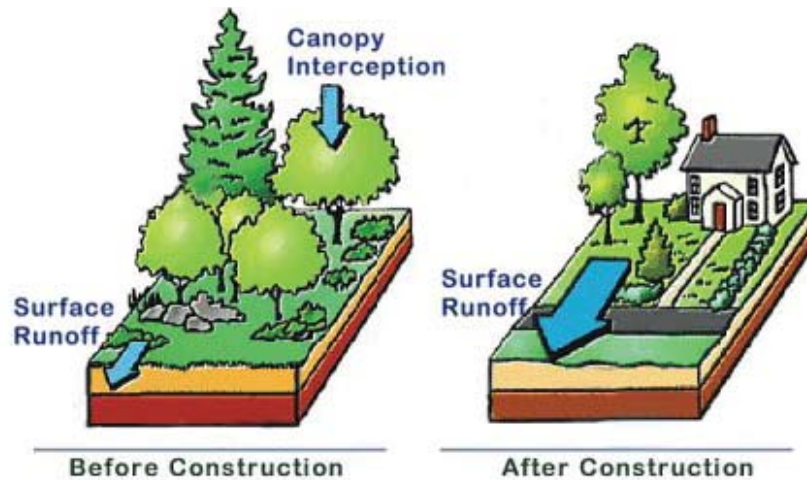
⁵ StreamWatch, 2008 Stream Conditions Report; 2009 Draft Fluvanna Comprehensive plan, page NE-8.

⁶ Building a Cleaner James River: Improving Local Building Codes and Ordinances to Protect the James River and its Tributaries. James River Association. 2006.

⁷ Virginia Department of Environmental Quality, Final 2006 305(b)/303(d) Water Quality Assessment Integrated Report, p. 3.1-3 (approved by the Environmental Protection Agency on October 16, 2006).

example, that a one-acre parking lot creates 16 times more runoff than a meadow of the same size.⁸ Rain collects on these compacted, impervious surfaces and creates fast-moving flows that gush directly into nearby waterways or get flushed into stormwater sewers which lead to the waterways.

As a result, the flow into rivers and streams increases. As the higher flows rush through stream channels unaccustomed to such volumes and speeds of water, large amounts of sediment are carved away from the stream banks



By replacing natural terrain with pavement and rooftops, new land development often limits opportunities for precipitation to be absorbed by plants or to infiltrate the ground. As a result, a much higher percentage of precipitation becomes surface runoff after land is developed, posing significant threats to nearby waterways.

and stirred up from the streambeds.⁹ The increased sediment disrupts the river and shoreline ecosystems. Much of the eroded sediment settles to the streambed, where it smothers aquatic habitat. Such stream sedimentation can also fill in drinking water reservoirs, reducing their capacity over time and increasing water treatment costs.¹⁰

Second, the poor *quality* of stormwater can also be detrimental. Natural ground cover normally helps to slow and filter stormwater runoff. However, as rainfall collects upon and washes over paved surfaces, construction sites, and manicured lawns and pastures, it picks up soil, sediment, fertilizers, and bacteria present on those surfaces.¹¹ The runoff sweeps those pollutants into nearby waterways or drains them into stormwater sewers that usually discharge directly into waterways. This influx of pollutants can harm aquatic life and make rivers and streams unfit for recreation.¹²

The stormwater pollution described above occurs when forests and other pervious natural landscapes are replaced by impervious surfaces such as roads, parking lots, and roofs. These surfaces become, in effect, permanent parts of the landscape and represent a short- and long-term pollution concern. And, although the construction phase of development is relatively short-lived, it presents the greatest short-term risks for water pollution. Typically, construction activities remove the stabilizing layer of vegetation on a site. This practice exposes the underlying soil layers to the elements, causing them to erode much more rapidly. Stormwater runoff carries the eroded sediment – directly or indirectly – into rivers and streams, polluting the immediate vicinity and areas downstream. The longer soil is exposed at construction sites, the greater will be the resulting water pollution.

⁸ Chesapeake Bay Foundation, *A Better Way to Grow: For More Livable Communities and a Healthier Chesapeake Bay* (1996), p. 4.

⁹ Virginia Department of Conservation and Recreation, *Virginia Stormwater Management Program* (http://www.dcr.virginia.gov/soil_&_water/stormwat.shtml).

¹⁰ Thomas R. Schueler, *Why Stormwater Matters, The Practice of Watershed Protection* (Thomas R. Schueler and Heather K. Holland eds., 2000) (<http://www.stormwatercenter.net/Library/Practice/63.pdf>).

¹¹ Virginia Department of Conservation, note 6.

¹² Schueler, note 10.

A broad range of strategies can be employed by localities and developers to reduce stormwater pollution. These strategies include techniques to increase the amount of water that soaks into the ground on site (a process called infiltration), thus reducing the volume and intensity of stormwater runoff and helping to recharge groundwater aquifers. A number of Fluvanna County's ordinances (and those of other Virginia localities) inadvertently promote site designs that increase runoff. By removing some unnecessary regulatory obstacles to smarter development, and by encouraging more responsible site design and construction practices, Fluvanna County can reduce the adverse water quality impacts of new development and protect its water resources for the future.

BACKGROUND

In 2006 the James River Association (JRA) encouraged the Rivanna Conservation Society (RCS) to engage in an extensive analysis of the development ordinances and policies throughout the Rivanna River Basin. This effort was intended to be a follow-up to the JRA analysis that focused on the forty-five major localities in the James River watershed (including Fluvanna County).¹³ The JRA review used the Center for Watershed Protection's Code and Ordinance Worksheet to assign a numerical score to each locality. The Center for Watershed Protection's Code and Ordinance Worksheet contains a number of benchmarks used to measure how well a locality's building ordinances promote development practices and techniques that reduce stormwater runoff.¹⁴ The JRA used the Worksheet to score each locality in the James River Watershed, and we used the Worksheet as a starting point to help identify County practices and Code provisions that could be modified to yield greater water protection.

We then analyzed the Fluvanna County Code to identify specific areas for action and improvement and spent several months expanding and refining those findings based on discussions with County staff and interested citizens, as well as the collective experience and knowledge of our own organizations. The recommendations outlined below are the culmination of this effort, and they represent a manageable set of common-sense steps the County can take to reduce damage to its waterways caused by polluted stormwater runoff.

¹³ Working with students from the University of Virginia, Virginia Tech, and Virginia Commonwealth University, the James River Association published their findings in an informative report entitled *Building a Cleaner James River: Improving Local Building Codes & Ordinances to Protect the James River & Its Tributaries* (January 2007) (http://www.jamesriverassociation.org/watershed_scores.html).

¹⁴ Further information on the Code and Ordinance Worksheet, the model development principles on which it is based, and the process used to develop those principles may be found on The Center for Watershed Protection's Site Planning and Model Development Principles webpage: (http://www.cwp.org/22_principles.htm).

RECOMMENDATIONS

The recommendations in this report are grouped into four broad categories:

1. Promote better design and layout of new development sites.
2. Promote on-site infiltration and encourage low-impact development techniques.
3. Limit erosion from construction sites.
4. Implement an ordinance to protect riparian buffers in connection with new development.

I. PROMOTE BETTER DESIGN AND LAYOUT OF NEW DEVELOPMENT SITES

As described above, the amount of stormwater runoff generated in an area can increase considerably when its trees and meadows are replaced with buildings and pavement. In recent years, however, innovative approaches to minimize this effect have emerged in the design and layout of new development sites. These approaches focus on two goals: (1) avoiding the construction of excessive impervious surface and (2) using natural landscape features to absorb and treat runoff on site. These techniques are commonly referred to as “low-impact development” or LID.

This section of the report outlines some ways in which County Code provisions and County development policies can be enhanced or refined to provide developers flexibility and incentives to reduce impervious surfaces and promote on-site infiltration of stormwater. The recommendations in Section II then address ways to promote LID practices more generally.

Parking Lots

Large surface parking lots can generate massive volumes of stormwater runoff. A one-acre paved parking lot (43,560 square feet) will produce over 27,000 gallons of runoff during a one-inch rain.¹⁵ Runoff also collects pollutants that have accumulated on the parking lot surface and dumps them into local waterways. The recommendations in this subsection seek to reduce the stormwater impact of new surface parking lots by providing flexibility and incentives for developers to build smaller lots and to incorporate LID features into lot design.

1. Require that 20% of spaces within larger parking lots be designed to “compact car” dimensions (8' x 16').

The size of spaces in a parking lot will clearly affect the amount of land that gets paved. Parking lots are often configured so that every parking space can accommodate the largest class of automobile, even though roughly twenty percent of automobiles today are smaller “compact” cars.¹⁶

Requiring that an appropriate percentage of parking spaces within large parking lots be designed to “compact” dimensions can reduce the size of the parking lot while accommodating



Parking lots are one of the most significant sources of concentrated stormwater runoff.

¹⁵ Calculation available at North Carolina Clean Water Education Partnership website.

¹⁶ Mary Smith, *Vehicle Sizes Inch Down . . . Literally!*, Walker Parking Consultants (2007) (copy available from author).

the same number of vehicles. It can also increase the space available within the lot for LID stormwater management practices.

The County Code makes no mention of compact car spaces. In fact, the minimum dimensions required for parking spaces by § 22-26-4(B) of the zoning ordinance are greater than 8' x 16' (the dimensions of a compact space). The County should consider adding language to the zoning ordinance requiring that large lots contain a certain percentage of spaces for compact cars, thereby reducing the overall surface area of such lots.

We recommend that the County amend Article 26 of the zoning ordinance to require that twenty percent of parking spaces within parking lots of 10 or more spaces be designed to “compact car” dimensions (8' x 16') and be marked for use by compact cars only.

2. Decrease minimum parking space requirements for office buildings and retail shopping centers.

The number of parking spaces in a lot has a direct effect on the amount of land that is paved. Often, local ordinances specify a minimum number of parking spaces for various types of land uses, such as professional offices and retail space. When these minimum parking requirements exceed what a particular development is likely to require, the developer may be forced to build a larger lot than is really needed. Not only does this increase the amount of stormwater generated by the site, but it can also increase construction costs for the developer. To help localities provide the flexibility to build smaller lots where appropriate, the Center for Watershed Protection has developed recommended minimum numbers of parking spaces for major uses such as professional office buildings and shopping centers. These recommendations include a required minimum of three parking spaces per 1,000 square feet of gross floor area for office buildings and shopping centers.

Fluvanna's minimum off-street parking space requirements are contained in Article 26 of the zoning ordinance. Part of the Article's intent is to “avoid excessive impervious area” and to “protect valuable natural, historic, and scenic resources” in the County. At present, the zoning ordinance has tiered parking requirements. As the size of a building increases, the amount of square feet required to trigger another parking space also increases. For example, for retail stores and convenience stores, 1 parking space for every 200 square feet is required for the first 15,000 gross square feet, with the ratio increasing to 1 parking space for every 400 square feet thereafter. Shopping centers are similarly tiered, requiring 5 spaces per 1,000 square feet if the leasable square footage of the entire shopping center is less than 15,000 square feet; 4.5 spaces per 1,000 square feet if the leasable footage is between 15,001 and 50,000 square feet; and 4 spaces per 1,000 square feet if the leasable footage is greater than 50,000 square feet. Office buildings have different requirements ranging from 5 parking spaces per 1,000 square feet if the gross floor area is less than 10,000 square feet to approximately 3.5 spaces per 1,000 square feet if the gross floor area of the building is more than 50,000 square feet. On average, Fluvanna requires between 3 and 5 parking spaces per 1,000 square feet of office space and between 2.5 and 5 parking spaces per 1,000 square feet of retail space.¹⁷ Although for some tiers the minimums are in line with CWP recommendations, for many others, Fluvanna's ordinance requires more parking spaces than may be needed. Therefore, the minimum number of spaces for smaller developments could be lowered to provide developers the flexibility to build smaller lots if they choose.

We recommend that Article 26 of the zoning ordinance be amended to reduce the minimum parking ratio for office buildings and retail shopping centers to 3 spaces per 1,000 square feet for all sizes of developments.

¹⁷ See Zoning Ordinance of Fluvanna County, Table 1.

3. Lower the maximum parking space requirements for all parking areas.

Section 22-26-8 of the County Code sets the maximum number of parking spaces for all types of parking lots at forty percent greater than the minimum number required by the Code. Additionally, it allows developers to exceed this generous maximum with the approval of the Planning Commission and provides little guidance about the standards for such approval.

We recommended that the County consider a number of steps to discourage unnecessarily large parking lots. First, it could decrease the maximum allowable number of parking spaces from forty percent above the minimum to twenty percent. Albemarle County has already done this.¹⁸ Second, the County could require developers who wish to exceed this maximum to submit, along with their special use permit application, an official parking study demonstrating the need for additional spaces. The County could also condition approval of such overages on a commitment from the developer to install enhanced stormwater protections. For example, the County could require developers to retain the runoff from, or use pervious materials for, all parking spaces exceeding the maximum.

We recommend that Section 22-26-8(B) of the zoning ordinance be amended to reduce the maximum number of allowable parking spaces to twenty percent above the minimum. In addition, the County could require a parking study and enhanced stormwater protections on the site as a necessary condition to exceed the maximum.

4. Allow landscaped areas in parking lots to be designed to collect and filter runoff.

Landscaping requirements for parking lots in Fluvanna County focus mainly on aesthetics, not stormwater management. Of particular note, the County does not require parking lots to contain a specified percentage of landscaping. Instead, it merely specifies dimensions for landscaped islands.



This parking lot in Greene County's Gateway development directs stormwater runoff into a bioswale.

Although parking lot landscaping requirements have traditionally been based on a desire to improve aesthetics and provide shade, planted landscape areas can also be used to manage stormwater, as the pictures from Greene County demonstrate. However, current practices often isolate landscaping inside raised, impenetrable curbs, thus preventing infiltration of stormwater. Better designs are available. For example, if landscaped areas are built at a slightly lower grade than the adjacent portions of the parking lot and are not surrounded by curbs – or are surrounded by curbs with “cuts” or perforations – some runoff from the paved portion of the lot will

¹⁸ Albemarle County Zoning Code § 4.12.4(a).

drain into them. This will allow the landscaped areas to filter and absorb some of the runoff. Additionally, use of “back-up” drainage systems can address overflow that might otherwise result during heavy rainstorms. We recommend that the County Code establish a minimum landscaping requirement of ten percent of a lot’s area. Furthermore, to incentivize use of LID practices, we recommend that landscaping containing on-site retention and infiltration features count double towards the minimum landscaping requirement.

We recommend that Section 22-24-6 of the zoning ordinance be amended to incentivize construction of landscaped areas in parking lots that filter runoff from the paved parking surface.

Streets and Driveways

Streets and driveways contribute greatly to the impervious surface area of residential development. Streets typically account for roughly half of the impervious cover in the overall road network of traditional neighborhoods,¹⁹ driveways usually account for another twenty to thirty percent, and cul-de-sacs and other turn-arounds represent approximately seven percent.²⁰ Therefore, it is important to encourage developers to minimize the stormwater footprint of these surfaces.

Until recently, Fluvanna County’s hands have largely been tied by the inflexible rules issued by the Virginia Department of Transportation (VDOT) regarding acceptance of streets into the Commonwealth’s maintenance network. However, the Virginia General Assembly recently passed legislation requiring that these “Secondary Street Acceptance Requirements” be updated, with minimizing stormwater runoff as a major goal of the revision.

Pursuant to this direction, VDOT has finalized its new regulations, which grant localities increased flexibility to incorporate LID measures into roadway rights-of-way and within cul-de-sacs. Fluvanna County can ensure that its own design standards and subdivision ordinances complement the new regulations. Because the County is currently revisiting some of its subdivision ordinances anyway, now is an excellent time to evaluate whether these ordinances fully utilize the flexibility of the new VDOT regulations. Below are some specific suggestions for the County to consider.

1. Explicitly allow perforated curbs along roadsides in the Development Areas, and publish guidance demonstrating acceptable designs.

Conventional curb and gutter systems collect all the stormwater runoff from the roadbed and channel it directly to the storm sewer system. However, in appropriate circumstances, roadside curbs can be “perforated” with periodic cuts which divert runoff into planting strips and other vegetated areas, thus helping to slow, filter, and absorb it. Also, as with landscaped areas in parking lots, “back-up” drainage features can be used to address potential overflow during unusually heavy storms.



Periodic curb cuts allow for streetside infiltration of stormwater, reducing the amount of runoff that enters storm sewers. Photo courtesy of Lower Columbia River Estuary Partnership.

In step with the adoption of the new Secondary Street Acceptance Requirements, the County could add a sentence to its subdivision street ordinance to make clear that properly designed perforated curb systems are an acceptable alternative to traditional curbs and gutters. To further encourage use of LID features, we recommend

¹⁹ Thomas R. Schueler, *Headwater Streets* (Ch. 6), *Site Planning for Urban Stream Protection* (1995) (<http://www.cwp.org/SPSP/TOC.htm>).

²⁰ *Id.*

that the County publish a guidance document demonstrating acceptable designs.

We recommend that the subdivision ordinance be amended to expressly allow perforated curb designs for public and private streets, and that the County publish a guidance document demonstrating acceptable designs.

2. Explicitly allow landscaped islands in the middle of cul-de-sacs, and publish guidance demonstrating how the islands can be outfitted with LID stormwater treatments.

Cul-de-sacs have been increasingly discouraged in recent years by VDOT because they limit connectivity between different developments and thereby increase congestion on larger connector roads. In those instances when cul-de-sacs are used, however, they can be designed to minimize stormwater impact. Fortunately, this is another area in which the new Secondary Street Acceptance Requirements grant localities increased flexibility.

Creating landscaped islands in the middle of cul-de-sacs will reduce the amount of impervious pavement – and thus the amount of stormwater runoff – in the County’s developments. Subsection 19-8-1(a) of the County Code adopts VDOT standards for residential streets, and these standards already allow for landscaped islands within cul-de-sacs. However, the County could make the permissibility of such islands more explicit. And, if a landscaped island is built at a lower elevation than the adjacent roadway and is surrounded by a perforated curb or no curb at all, it can treat runoff from elsewhere on the road. Such practices are explicitly contemplated by VDOT’s new regulations and could therefore be explicitly allowed in the County Code.²¹ Furthermore, the County could provide guidance about how to incorporate LID features such as curb cuts into cul-de-sac islands.

We recommend that the County amend Subsection 19-8-1(a) of its Code to expressly allow for cul-de-sac islands, and that it publish a guidance document demonstrating how LID stormwater features such as curb cuts can be incorporated into cul-de-sac islands.

Site Layout

Recommendations to this point have focused on standards and designs that mitigate the stormwater impacts of two major sources of pavement in new developments: roads and parking lots. Improved layout of a development can also reduce stormwater impacts. Such layout improvements include preserving existing stands of trees on development sites, promoting greater tree canopies on completed developments, and protecting extraordinary trees.

1. Explore incentives for developers to preserve existing trees on new development sites.

In addition to the aesthetic, economic, and air quality benefits provided by healthy trees in a development, they also help protect nearby waterways. A leafy tree canopy provides an initial barrier to rainfall, reducing the erosive force with which raindrops hit the earth. In addition, the leaves and the roots of trees absorb and filter rainwater that falls on and around them, thus decreasing the amount of rainfall that becomes stormwater runoff. These benefits are especially valuable during the critical stages of high erosion during and after construction. The Virginia Code requires that tree protection ordinances emphasize the preservation of existing tree canopies where such canopies meet local standards and where it is feasible to do so within the framework of design standards on the site.²²

In its current form, the Fluvanna County Code does not mandate the protection of existing trees in new developments, nor does it establish a canopy requirement. Instead, it requires all development projects over

²¹ 24 VAC 24-92-120 (F).

²² Va. Code Ann. 15.2-961.1.

one half acre to create a Tree Protection Plan.²³ The Tree Protection Plan must be prepared by a certified specialist such as an arborist or horticulturist as deemed to be qualified by the Director of Planning. The plan must establish tree protection zones, and the ordinance provides guidelines promoting protection of existing stands of trees or individual specimen trees whose removal is not necessary for the development of the site. The protection of trees is thus left to the site plan, approval of which is granted by the Director of Planning. In other words, because the Code's guidelines are not mandatory, prevention of harmful practices such as leveling all trees on a site is left to the discretion of the Director of Planning.

The County's tree protection ordinance has functioned well, but it does not protect existing trees or promote an adequate canopy for completed development – both of which will become more important as development pressures increase. Fluvanna County should consider supplementing its tree protection ordinance to establish minimum canopy requirements and to provide incentives for protecting existing trees.

We recommend that the County amend its Code to more explicitly state that the preservation of existing trees on a development site is preferable to the planting of new ones, and to require developers to justify the use of newly planted trees that come at the expense of existing ones. We further recommend that the County explore adopting a specific tree canopy requirement.

2. Adopt a tree conservation ordinance allowing for the designation of specific trees for protection.

Native trees, shrubs, and grasses are important contributors to water quality and to the overall health of the environment. In addition, they can provide noticeable economic benefits to developers and homeowners.²⁴ Large heritage, memorial, or specimen trees are the oldest and most valuable and beautiful trees in a stand. The preservation of such trees can promote the rural look and feel of Fluvanna County and increase the property values of homes and businesses.

The County should consider adopting a tree conservation ordinance pursuant to the enabling authority provided in the Virginia Code.²⁵ Such an ordinance would allow willing landowners to establish protection for historic or significant trees. Currently, there is no firm requirement in Fluvanna County that exceptional trees or wooded areas on a development site be protected. As discussed in the previous recommendation, the Fluvanna Code currently allows entire sites to be razed, thus removing trees that would slow and filter runoff during and after construction.

Although its reach would be limited to specific trees the County designates in cooperation with landowners, a specimen tree protection ordinance would help ensure that the stormwater benefits provided by the County's most outstanding trees would be insulated against future development. It would also help maintain the rural look and feel of Fluvanna County. Other Virginia localities, such as Fairfax City²⁶ and Arlington County,²⁷ have adopted tree conservation ordinances to protect specific trees deemed worthy of preservation.

We recommend that the County adopt a tree protection ordinance that allows for the designation by the County and willing landowners of specific trees deemed worthy of preservation.

²³ Fluvanna County Code § 22-24-1 (Tree Protection).

²⁴ Center for Watershed Protection, *An Analysis of the Development Codes and Ordinances of Goochland County, Virginia*, 35.

²⁵ Specifically, section 10.1-1127.1 of the Virginia Code gives localities the authority to adopt tree conservation ordinances.

²⁶ City of Fairfax, Va., Code § 110-257 (2007).

²⁷ Arlington County, Va., Code § 67-3 (2007).

II. PROMOTE ON-SITE INFILTRATION AND ENCOURAGE LOW-IMPACT DEVELOPMENT TECHNIQUES

As discussed throughout this report, a new approach to stormwater management has emerged in recent years. It uses techniques collectively known as “low impact development” (LID) to manage rainwater where it falls. Because LID practices use natural systems to filter pollutants and allow runoff to infiltrate the ground, they can simultaneously improve the quality and decrease the quantity of runoff that flows from a development site. These techniques would be particularly beneficial for development occurring in the County’s growth areas.

The Rivanna River Basin Commission (RRBC) is currently engaged in a multi-year effort to help localities reduce stormwater pollution. One focus of the program is to provide LID materials and technical assistance to localities and developers. In addition, the RRBC may generate locality-specific ideas to incentivize implementation of LID programs. How these recommendations are implemented, moreover, may depend on the new Virginia Stormwater Management Program regulations approved by the DCR, which are scheduled to go into effect in early 2010.

1. Offer incentives for LID.

Recent research by the U.S. Environmental Protection Agency suggests that incorporating LID practices into a development will usually reduce its overall cost in addition to minimizing its environmental impact.²⁸ However, even when LID practices tend to lower costs, developers may still choose not to implement them because they fear protracted approval processes or difficulties with installation or maintenance.

Fluvanna can address these barriers and “jump-start” the use of LID practices by offering incentives to incorporate LID features into new and existing developments. For example, Fluvanna could reduce or waive application fees for developers who install LID hardware, preserve open space, or meet certain height or density goals. The County could also offer real estate tax reductions for owners of energy efficient homes and businesses, as the City of Charlottesville recently has done.

We recommend that the County pursue enabling authority to provide incentives for homeowners and developers to use LID practices. We further recommend that it explore specific LID options such as biofilters, pervious pavers, green roofs, rainwater harvesting systems, and others.

2. Publish guidance on LID options.

While some landowners and developers might be waiting for short-term economic incentives before considering LID, others likely desire to use LID techniques but lack the technical or regulatory knowledge to implement them. Therefore, written guidance about the implementation of LID practices, with explanations of the associated regulations, would help landowners and developers to utilize these practices in their homes or development projects.

Many stormwater management practices are described in detail in the Virginia Stormwater Management Handbook and associated technical bulletins. Additionally, these materials may soon be revised based on new stormwater regulations proposed by the DCR. The County could supplement these materials by publishing its own guidance detailing specific LID practices discussed in this report. Similarly, the County could leverage technical materials, training, and other assistance eventually provided by the RRBC.

²⁸ A recent U.S. Environmental Protection Agency report analyzed seventeen case studies of developments and compared the costs of applying LID stormwater controls to the costs of traditional stormwater controls on the same developments. The report concludes that in the vast majority of cases, significant savings were realized and environmental performance was improved when LID methods were used. U.S. Environmental Protection Agency, *Reducing Stormwater Costs through Low Impact Development Strategies and Practices*, Publication Number EPA 841-F-07-006 (December 2007) (<http://www.epa.gov/owow/nps/lid/costs07/>).

We recommend that the County utilize materials from the DCR and the RRBC to create its own guidance documents and training resources promoting LID stormwater management practices such as:

- *periodic curb cuts allowing stormwater to drain from roads into adjacent vegetated areas;*
- *landscaped areas in parking lots and cul-de-sacs that filter and absorb runoff from the surrounding pavement;*
- *rainwater harvesting systems on new and existing buildings;*
- *LID stormwater management devices like swales and biofilters; and*
- *green roofs.*



Green roofs, such as this one for Albemarle County's office building, represent one possible LID measure Fluvanna can encourage.

III. LIMIT EROSION FROM CONSTRUCTION SITES

When clearing, grading, and other construction activities expose bare earth to the elements, the soil erodes much more rapidly. According to the DCR, erosion at construction sites can be 200 times greater than that on cropland and 2,000 times greater than that in woodlands.²⁹ Similarly, a guidance document published by the United States Environmental Protection Agency notes that erosion rates from natural areas such as undisturbed forested lands are typically less than one ton per acre per year, whereas erosion rates from construction sites range from seven to 500 tons per acre per year.³⁰

The primary regulatory mechanism in Virginia for dealing with this problem is the Erosion and Sediment Control Program ("E&S program"). The E&S program requires developers to submit and implement a plan ("E&S plan") explaining the sediment-reduction measures they will undertake on a construction site. At the heart of the E&S program regulations are nineteen "minimum standards" that all E&S plans must satisfy.³¹ As their name suggests, these minimum standards provide only a baseline layer of protection. Even when an E&S plan fully complies with the state's standards and is properly implemented by the contractors, a significant amount of sediment-laden runoff can escape a construction site. Further, some of the minimum standards are vaguely worded and contain loopholes.

Local governments have the explicit authority to require stronger erosion protections than those contained in the minimum standards.³² We have identified an important upgrade Fluvanna County can make to its local erosion control program to limit the amount of sediment that gets washed from construction sites into local

²⁹ Virginia Department of Conservation and Recreation, *Virginia's Erosion and Sediment Control Program* (http://www.dcr.virginia.gov/soil_&_water/e&s.shtml).

³⁰ U.S. Environmental Protection Agency, *National Management Measures to Control Nonpoint Source Pollution from Urban Areas, Management Measure 8: Construction Site Erosion, Sediment, and Chemical Control*, Publication Number EPA 841-B-05-004 (Nov. 2005) (available for download at <http://www.epa.gov/owow/nps.urbanmm>).

³¹ 4 Va. Admin. Code 50-30-40 (2008).

³² Va. Code Ann. § 10.1-570 (2008).



Construction sites generate much more sediment pollution than typical vegetated land.

waterways. We have also identified potential improvements to the County's form contract for agreements-in-lieu-of-a-plan.

1. Require all erosion and sediment control plans to include a time limit by which all denuded terrain must be permanently revegetated.

When soil is protected by permanent vegetative cover, erosion occurs much less rapidly than when it is denuded (barren, without vegetation). Thus, limiting the amount of time that a development site is denuded will reduce the amount of sediment that gets washed into waterways.

Virginia regulations require that denuded terrain at construction sites be revegetated *once grading is complete* or if grading will not occur for a specified amount of time.³³ However, these regulations have an obvious loophole: developers can delay revegetation simply by doing marginal grading work on the site whenever the deadline for revegetation approaches, thus resetting the statutory clock.

Virginia regulations require that denuded terrain at

To close this loophole, the County could require that permanent vegetation be restored to all denuded areas of a construction site within a certain number of months after grading begins. In recent rezonings, Albemarle County has worked with some developers to address this loophole via proffers. These proffers required that permanent vegetation be in place on all denuded areas of a construction site within a certain number of months after grading begins (except for any areas of the site covered by a building permit for construction of roads or structures),³⁴ thus providing a clear deadline for revegetation and helping to minimize the amount of eroded sediment that reaches the waterways.

Although the proffer solution worked in this case, a better solution would be to set an outer time limit for destabilization in the E&S ordinance itself. This would make the better standard applicable to all developments, not just those requiring rezoning. For this reason, Albemarle County amended its E&S ordinance in August 2009 to adopt a nine-month outer time limit for all sites requiring an E&S plan. The Albemarle ordinance includes a clear deadline but also incorporates flexibility for difficult sites by allowing for staff to grant a short (six-month) extension, or the Board of Supervisors a longer one, if certain criteria are met.³⁵ We recommend a similar change to Fluvanna's E&S ordinance.



Under current law, occasional grading allows developers to avoid their obligation to stabilize denuded areas, like this site near Zion's Crossroads.

³³ 4 Va. Admin. Code 50-30-40 (2008).

³⁴ For example, the developers of the Biscuit Run project recently proffered the following as part of the rezoning for that project: "Within nine (9) months after the start of grading under any erosion and sediment control permit, permanent vegetation shall be installed on all denuded areas, except for areas the Program Authority determines are otherwise permanently stabilized or are under construction with an approved building permit. A three (3) month extension for installation of permanent vegetation may be granted by the Program Authority due to special circumstances including but not limited to weather conditions."

³⁵ Albemarle County, Va., Code § 17-207(B)(3) (2009).

We recommend that the County amend its erosion and sediment control ordinance to require that all erosion and sediment control plans include a time limit by which all denuded terrain must be permanently revegetated.

2. Expand the list of erosion control measures explicitly referenced in the form contract the County uses for agreements-in-lieu-of-a-plan.

When a land-disturbing activity results from the construction of a single-family residence, Virginia law and the County's E&S ordinance allow the property owner to enter into an "agreement-in-lieu-of-a-plan" rather than submit a full E&S plan.³⁶ In contrast to a detailed, site-specific E&S plan, an agreement-in-lieu-of-a-plan is usually just a short form contract in which the landowner pledges to comply with all applicable erosion control requirements. This streamlines the construction planning and permitting process for landowners or developers proposing only to build a single house.

Because the agreements are broadly worded and often lack detail, they can be difficult to enforce. To address this problem, some localities append to such agreements a list of specific erosion protections required by state law for any site covered by an agreement-in-lieu-of-a-plan. The City of Norfolk, for example, expressly incorporates twelve conditions into its agreements, including, among other things, a requirement to stabilize all stockpiles of soil on the site during construction and a reminder that the contractor must inspect all erosion control measures after rainstorms to make sure they are working properly.³⁷ By explicitly spelling out the most critical requirements, Norfolk helps ensure that property owners and contractors are more familiar with the required practices for limiting erosion. In the Rivanna Basin, Albemarle County has recently begun to revise its form agreement to specify erosion mitigation requirements, such as the requirement mentioned above that all denuded areas of construction sites must be permanently revegetated within a certain time limit.

We recommend that the County expand the list of erosion control measures explicitly referenced in the form contract it uses for agreements-in-lieu-of-a-plan.

IV. IMPLEMENT PROTECTIONS FOR RIPARIAN AREAS IN CONNECTION WITH NEW DEVELOPMENT

The health of riparian areas – which consist of the land immediately surrounding streams and other water bodies – plays a critical role in water quality. A healthy, vegetated riparian area stabilizes stream banks, limits erosion, and filters pollution. A disturbed riparian area can be a chronic source of sediment and other pollution. As run-off occurs, especially on steeper slopes, the buffer slows the water down, providing time for infiltration and the capturing of pollutants, including sediment. Additional benefits of riparian buffers include nutrient removal, habitat protection, tree canopies, temperature stabilization, and improved levels of pH and dissolved oxygen.

A number of state policies promote riparian buffers. The State's Chesapeake Bay Tributary Strategy sets a goal of conserving and restoring forests along at least seventy percent of all streams and shoreline throughout Virginia's portion of the Bay watershed. In addition, regulations pursuant to the Chesapeake Bay Preservation Act ("Bay Act") require counties within the Chesapeake Bay protection area to adopt buffers ordinances. Such ordinances must include a 100-foot buffer in resource protection areas in order to reduce sediments and nutrients reaching the Bay.³⁸

Fluvanna County currently has no ordinance protecting riparian areas in connection with new development, and its subdivision ordinance does not require protection of riparian buffers as part of a subdivision or site plan. RCS therefore recommends that Fluvanna County amend its ordinances to provide greater protection for

³⁶ Va. Code Ann. § 10.1-563 (2008); Greene County, Code § 38-74(b) (2003).

³⁷ A copy of Norfolk's agreement-in-lieu-of-a-plan is available at http://norfolk.gov/Planning/Applications/Erosion_Sediment.pdf.

³⁸ See 9 VAC 10-20-80.



Volunteers planting riparian tree buffers.

riparian areas in connection with new development. A variety of land use activities affect stream buffers in Fluvanna County, including agriculture, forestry, and development. Although riparian buffers protection for new development is just one piece of the puzzle, it is an important and timely piece.

Fluvanna can look to several examples in the region for guidance in implementing a riparian buffer. Some counties have followed the Bay Act model for riparian buffers, even when not required to do so. For example, Albemarle County has implemented comprehensive buffers protections through its water protection ordinance. This requires that buffers be preserved or established near certain water resources, and it limits the activities that can occur within those buffers. Generally, a buffer width of 100 feet is required adjacent to streams, ponds, and wetlands. Around each public water supply reservoir, buffers must extend 200 feet from the 100-year flood-plain. Generally, these requirements are triggered for developments needing a stormwater plan.³⁹

Other Virginia localities have adopted buffers protection ordinances that do not follow the Bay Act model. For example, within Goochland County's rural preservation districts (RPD), fifty percent of net acreage must be devoted to "conservation areas." The remainder of such districts is reserved for single-family residential development. The ordinance requires that 100-foot buffers (for perennial streams) or fifty-foot buffers (for intermittent streams) be included "where practicable," and such buffers count toward the required "conservation area" of a development.⁴⁰ Nelson County, on the other hand, simply requires a fifty-foot buffer around "any stream" in a new development requiring site plan approval,⁴¹ and Amherst has created a Watershed District overlay, with buffer requirements tied to the overlay.⁴²

We recommend that Fluvanna County amend its ordinances to protect riparian areas in all new developments requiring a site plan, master plan, or subdivision plat approval. Such a change would require new developments to avoid building in the riparian buffer zone and to develop a plan for protecting and maintaining a vegetated riparian buffer. Based on Fluvanna's existing code, the following approach would work well: Fluvanna could amend Article 23 of its zoning ordinance (which deals with the required contents of site plans) to require that every major site plan include a plan for protecting an area within 75 feet of every perennial or intermittent stream. The ordinance could also include a list of acceptable activities in riparian areas, such as creating walking trails, cutting down dangerous trees, and other low impact activities. This ordinance would apply only to new

³⁹ Albemarle County, Va., Code § 17-317 (2009).

⁴⁰ Goochland County, Va., Code § 5-7-11(3) (2009).

⁴¹ Nelson County, Va., Code § 4-3(A) (2010).

⁴² Amherst County, Va., Code § 710 (2009).

development, would not apply to the construction of individual homes, and would help minimize the harmful effects of future development on the County's riparian areas.

We recommend that Fluvanna County amend its zoning ordinance to include a riparian buffer protection plan among the requirements for a major site plan.

CONCLUSION

Fluvanna County is in an excellent position to protect its water quality now and into the future. Although it has grown rapidly in recent years, its rivers and streams are still relatively healthy. In contrast, large portions of the Rivanna River system in the urbanized areas of Albemarle County and Charlottesville are significantly impaired by stormwater runoff. If Fluvanna takes appropriate steps now and continues to participate in comprehensive watershed protection efforts, it can protect its waters from future harm that might otherwise accompany its ongoing growth.

This report highlights a number of ways in which the County's ordinances and policies can be refined to foster management and development decisions that help protect local waterways. By removing unnecessary regulatory obstacles to smarter development patterns, strengthening water protections where loopholes currently exist, and providing stronger incentives for more sensitive land stewardship, Fluvanna County can ensure cleaner and healthier rivers and streams for its current and future residents.



Construction of the new Rivanna Bridge at Palmyra 2006.

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