

**Stormwater Management Policy**  
*including*  
**the Runoff Limits Program**

**August, 2006**

The Etowah Aquatic Habitat Conservation Plan (HCP) Stormwater Management Policy was developed by a technical committee of professionals and local government staff from the Etowah watershed through several meetings from 2004 to 2006. The Steering Committee approved the Stormwater Management Policy in several phases on July 23, 2004, October 21, 2005, April 28, 2006 and July 21, 2006. It is the intent of the HCP Steering Committee that the Stormwater Management Policy be adopted by all jurisdictions participating in the HCP prior to receiving an Incidental Take Permit from US Fish and Wildlife Service and that, once implemented, the policy will help minimize and mitigate the take of imperiled aquatic species in the Etowah Watershed.

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## Executive Summary

Most rain that falls onto roads, parking lots, roofs and other impervious surfaces runs off and is channeled quickly to streams in storm sewers. This stormwater runoff carries debris, chemicals, metals, and other pollutants to streams, and the high flows during storms can scour stream banks and lead to sedimentation. Scientists studying the imperiled fish of the Etowah believe that stormwater runoff is currently the greatest threat to their survival.

The stormwater management policy of the Etowah Aquatic HCP is centered around a stormwater ordinance adapted from the Metropolitan North Georgia Water Planning District (“Metro District”) ordinance. The two ordinances are identical in many important respects so that jurisdictions within the Metro District can meet both requirements in a single set of regulations. Both ordinances include performance standards for water quality protection, stream channel protection, and flood protection. In addition, the Etowah Aquatic HCP stormwater ordinance includes a performance standard that limits the volume of runoff in areas most critical to the survival of fish species covered under the Etowah Aquatic HCP. This “Runoff Limit” standard is critical to protecting imperiled species of the Etowah.

The areas where the Runoff Limits apply are known as Priority Area 1 and Priority Area 2. Priority Area 1 is home to the most sensitive species protected by the HCP and so has the most restrictive standard. Priority Area 2 supports species that are less sensitive and has a less restrictive standard. Parts of the Upper Etowah that do not currently provide essential habitat to any imperiled fish are classified as Priority Area 3 and are not subject to the Runoff Limits (see Figure 2 in body of document). In Priority Area 1, the volume of runoff generated from the two-year design storm must be the same as if the site were in a forested condition—in other words, the site must “act like a forest” as far as runoff is concerned for small storm events. In Priority Area 2, new development projects are allowed to generate an additional volume of runoff; however, it can not exceed the amount that would occur if the site were 95% forested and 5% impervious. In both Priority Areas 1 and 2, local governments can designate some locations as “development nodes,” where Runoff Limits are significantly relaxed.

To meet the Runoff Limits, developers can use “Better Site Design” techniques to reduce the amount of impervious cover, as well as various stormwater infiltration best management practices to return runoff to the soil. Use of these practices is supported by an engineering manual and by a training program. An optional Better Site Design checklist has been developed to assist local governments in working with developers in pre-construction meetings to use these practices. Jurisdictions are also encouraged to amend regulations to allow the use of all Better Site Design techniques, although this is not required.

The technical committee developed provisions for inspection and maintenance to help ensure the ongoing functioning of stormwater management practices. These have been incorporated into the model ordinance. Funding to support inspection and maintenance can be provided by an optional stormwater utility.

All local governments participating in the Etowah Aquatic HCP whose jurisdictions include Priority Areas 1 or 2 must adopt the Etowah Aquatic HCP Stormwater Ordinance although the ordinance need only apply within Priority Areas 1 and 2. These jurisdictions must also adopt an official Priority Areas and Development Node Map.

## Introduction

Stormwater runoff from impervious surfaces, a byproduct of urbanization and suburbanization, is thought to be the greatest threat to imperiled fishes in the Etowah basin. Extensive studies have shown that urbanization and suburbanization of watersheds lead to degradation of fish assemblages and the local extinction of some fish species (Klein 1979, Meador et al. 2005, Morgan and Cushman 2005, Walters et al. 2003, Wang et al. 2001). Watershed development causes a cascade of effects, including changes to stream hydrology, geomorphology, water temperature and stream chemistry, as well as inputs of various toxins (for recent reviews, see Allan 2004, Paul and Meyer 2001, Walsh et al. 2005b). The primary mechanism for many of these effects is stormwater runoff from impervious surfaces (Walsh et al. 2005b).

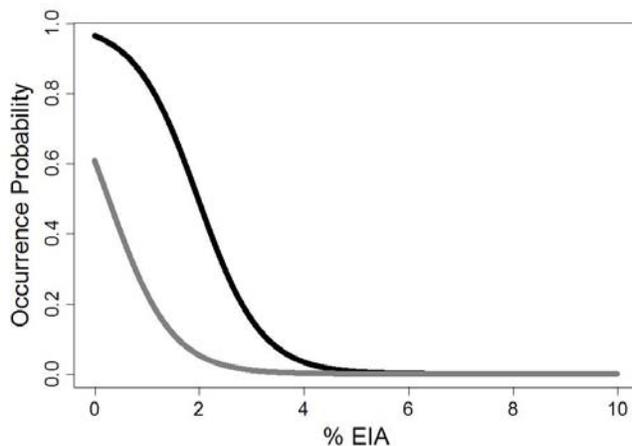
An increase in impervious cover (roads, parking lots, rooftops, etc.) leads to increased stormwater runoff and reduced infiltration of rainfall. As a result, the storm flows of urban streams can be much higher than those of rural streams, causing scouring of stream channels. Channel erosion, in turn, can lead to downstream sedimentation. Both the high flows and the associated sedimentation can impact sensitive fish species. In addition, reduced infiltration leads to lower base flows and less water in streams between rainfall events. This further reduces habitat for some fish.

In addition to hydrologic impacts, stormwater runoff is a major source of pollutants. Streets and parking lots can contribute large quantities of heavy metals and nutrients (Bannerman et al. 1993) as well as hydrocarbons (reviewed in Paul and Meyer 2001). These can affect fishes via direct mortality, various sublethal effects, and reduction in food base. Finally, impervious runoff is often much warmer than the receiving waters, and the temperature alteration may lead to further impacts on sensitive fish species. Research has shown that the greatest impact comes from impervious cover that is directly connected to streams via the storm drainage network (Hatt et al. 2004, Walsh et al. 2004b), which is sometimes referred to as Effective Impervious Area or EIA.

Studies in the Etowah basin have confirmed that urbanization and suburbanization lead to the loss of sensitive fish species. Walters et al. (2003) found evidence that urbanization leads to homogenization of fish communities in the Etowah—that is, fish communities become more alike as the sensitive and specialized species are eliminated. A subsequent study, conducted as part of the development of the Etowah Aquatic HCP, evaluated hydrologic alteration as a mechanism for changes in the fish assemblage and found correlations between several measures of hydrologic change and fish assemblage health (Roy et al. 2005). This is an indicator that increased stormwater runoff from impervious cover, and the consequent hydrologic alteration is causing the extirpation of sensitive fish species.

More recently, we examined the response of individual species in the Etowah to increased effective impervious area in the Etowah. We found that species varied in their sensitivity to EIA but that some species do not occur above low levels of EIA. Through these analyses we constructed models to predict the occurrence of species in the future. The model for the Etowah darter, one of the federally endangered fish species, is shown in Figure 1. Note that the model predicts that the fish will disappear at about 3-4% EIA—equivalent to a low density of residential development. For the Etowah darter to survive, EIA must be below this level in at least a portion of its range. This can be accomplished through highly effective stormwater management.

**Figure 1. Probability of Occurrence of the Etowah Darter in Response to Increasing Effective Impervious Area (EIA).** Black line represents a large stream; gray line, a mid-sized stream.



Traditional stormwater management was geared toward preventing flooding. It called for rapid conveyance of runoff through storm sewers to streams, with detention ponds employed to reduce peak flow rates. However, this approach did little to protect water quality and prevent degradation of streams caused by hydrologic alteration; in fact, it made some problems worse (Booth and Jackson 1997). More recently, stormwater ordinances have added requirements for water quality treatment and extended detention in an attempt to reduce these impacts. An example is the post-construction stormwater ordinance of the Metropolitan North Georgia Water Planning District (the “Metro District”) (Metropolitan North Georgia Water Planning District 2004).

While a great improvement, even these requirements are not sufficient to ensure that EIA remains below the levels necessary to ensure the survival of the imperiled fish species of the Etowah. However, scientists have noted that the problem of stormwater runoff can be solved if the excess runoff (beyond what would occur in a forested setting) from small storms is infiltrated back into the soil as close as possible to where it is generated. This provides near-natural hydrologic function and highly effective pollutant removal (Ferguson 1994, Hatt et al. 2004, Walsh et al. 2005a, Walsh et al. 2004a).

The stormwater management policy of the Etowah Aquatic HCP reflects these principles. At the heart of the policy is a post-construction stormwater management ordinance based on the Metro District Ordinance so that all of the jurisdictions in the Etowah that are members of the Metro District can meet the requirements of both programs in one set of regulations. However, the Etowah Aquatic HCP stormwater ordinance adds a requirement known as “Runoff Limits,” an additional performance standard requiring that the volume of runoff leaving a site be limited to natural or near-natural levels. Meeting this requirement entails the use of infiltration best management practices (BMPs). The Runoff Limits requirement applies only in watersheds designated as “Priority 1” and “Priority 2,” which support significant populations of imperiled fish. The ordinance also includes specific maintenance and inspection requirements to ensure that BMPs are adequately maintained.

An important approach to meeting the Runoff Limits requirements is through “Better Site Design” (BSD) techniques. These entail minimizing runoff by minimizing impervious cover—reducing road widths, reducing parking areas, building more compactly. Use of these approaches can be a win-win situation—reducing construction costs while reducing runoff,

without the need for engineered BMPs. Local governments are strongly encouraged to amend their subdivision regulations to give developers greater flexibility to implement BSD, but this amendment is not required under the Etowah Aquatic HCP.

## **Committee Process**

The Etowah Aquatic HCP Stormwater Management Policy was developed by a technical committee composed of local government staff, local developers, homebuilders, consulting engineers and landscape architects working in the Etowah watershed. The committee developed the policy in three phases. The first phase involved development of the basic ordinance, without the Runoff Limits program, and a checklist to encourage the use of Better Site Design approaches. To complete these materials, the technical committee met several times during the first half of 2004. The technical committee reviewed the existing development codes of the nine counties and five largest cities in the watershed using the Center for Watershed Protection Codes and Ordinances worksheet (Appendix A-2) and prepared draft Better Site Design guidelines and a model stormwater ordinance. The draft stormwater ordinance was based on the Metropolitan North Georgia Water Planning District's (Metro District) post-development stormwater management ordinance. The recommendations of the committee were adopted by the Steering Committee on July 23, 2004.

The second phase of the technical committee's work involved development of the Runoff Limits program, along with recommendations for maintenance and inspection of stormwater BMPs. The technical committee met several times during August, September and October, 2005, to develop these recommendations. As part of the program, the technical committee members agreed to a stormwater management performance standard. The use of a performance standard gives flexibility to developers and engineers when designing new developments while encouraging infiltration of runoff from small storms that provides large benefits to the imperiled species covered by the HCP. Additionally, using infiltration BMPs can reduce the size of detention ponds, providing some cost savings. However, the technical committee also had concerns about the program. Members were concerned about the ability of soils in the Etowah to infiltrate stormwater; the required use of forested site conditions as a baseline for determining predevelopment runoff volumes; and ownership, inspection and maintenance of BMPs post-construction. After long and productive discussions the committee agreed to a variety of provisions that addressed members' concerns while retaining the benefits of the Runoff Limits approach. The Steering Committee approved these components on October 21, 2005.

The third phase of the technical committee's work included development of the Runoff Limits Manual. The manual specifies the methods for performing Runoff Limits calculations and includes engineering and other design guidelines for structural and non-structural stormwater BMPs used to comply with the Runoff Limits performance standard. The Technical Manual is modeled after the Georgia Stormwater Management Manual (the "Blue Book"). As of this writing, the manual is in the final stages of review. Through meetings from November, 2005, through August, 2006, the committee has agreed on calculation methods and other critical components but has not yet approved all BMPs.

Concurrent with the development of the manual, staff worked with the local governments participating in the Etowah Aquatic HCP to identify development nodes for the Runoff Limits program. Development nodes are locations identified by local governments where more lenient performance standards apply under the Runoff Limits program (see below). As part of this process, staff proposed formalized procedures for determining whether proposed development

nodes are acceptable and for modifying development nodes in the future. These procedures rely on “population thresholds” established by the Etowah Aquatic HCP Scientific Advisory Committee, which set the maximum allowable reduction in populations of imperiled fish that will not jeopardize the survival of the species (refer to the Etowah Aquatic HCP document for details on the population thresholds and their development). The Steering Committee approved these procedures on April 28, 2006, and July 21, 2006.

The next section describes the stormwater management policies of the Etowah Aquatic HCP.

## Stormwater Management Policies

### *The Etowah Aquatic HCP Stormwater Ordinance*

Many communities in the Greater Atlanta metropolitan region must comply with NPDES Phase II stormwater regulations, which require post-development stormwater management. Because of this need, the Metro District developed a model post-development stormwater ordinance. Members of the Etowah Aquatic HCP that are subject to the Metro District requirements include the counties of Bartow, Cherokee, Cobb, Forsyth, Fulton and Paulding and cities lying within those counties (Dawson, Lumpkin and Pickens counties, and their cities, are the Etowah Aquatic HCP jurisdictions that are not part of the Metro District). Therefore, the Metro District ordinance was used as a model for the HCP ordinance to ensure that those governments would comply with Metro District regulations. The major performance standards of the Metro District ordinances are as follow:

- Water quality protection: capture and treat runoff from all storm events of 1.2” or less, as well as the first 1.2” of runoff for all larger storm events.
- Channel protection: provide 24 hours of extended detention for runoff generated by the one-year, 24-hour storm event.
- Overbank flood protection: reduce the post-development 25-year, 24-hour storm event peak discharge rate to no more than the pre-development discharge rate.
- Extreme flood protection: design all stormwater management facilities to safely convey the runoff from the 100-year, 24-hour storm event.

In reviewing the Metro District ordinance, the Etowah Aquatic HCP Stormwater Management Technical Committee identified several provisions of the ordinance that could be improved to provide greater clarity, enforceability and stronger assurance of BMP maintenance. These changes are summarized in Table 1. The amended ordinance still meets the standards of the Metro District ordinance.

**Table 1. Comparison between Metropolitan North Georgia Water Planning District and Etowah Habitat Conservation Plan Model Post-development Stormwater Ordinances.**

Section	District Ordinance	HCP Ordinance
Applicability		Adds redevelopment that adds an additional 5000 ft <sup>2</sup> of impervious cover
Definitions		Revises definition of Better Site Design and hot spot; adds Stormwater BMP
Concept Plan and Consultation Meeting		Adds HCP Site Design Checklist to stormwater concept plan requirements
Performance Bonds	Left up to discretion of local jurisdiction	Requires bond no less than the total cost of stormwater management system;

Section	District Ordinance	HCP Ordinance
Application Review Fee	Fee based on structure established by local jurisdiction	bond released after final inspection Adds that all monetary contributions will be credited to local budgetary category to support plan review, administration and management of permitting process, and inspection and maintenance of projects subject to ordinance
Performance Criteria- Water Quality	Stormwater practices must treat first 1.2" rainfall of all storms and remove 80% of post-development total suspended solids	All stormwater runoff adequately treated before discharge
Performance Criteria- Stream channel protection	Requires preservation/restoration of buffer, erosion prevention measures, and 24-hr detention of 1-yr, 24-hr storm	Can reduce or waive detention requirement through the use of infiltration practices
Ongoing Inspection and Maintenance	Inspection and maintenance required	Adds and amends provisions that explicitly state responsible parties for maintenance; includes maintenance schedule and details of inspection reports.
Priority Areas / Runoff Limits	Not in ordinance	Designates stormwater runoff performance standards for watersheds essential for persistence of federally protected aquatic species. Includes provisions and performance standards for development nodes.

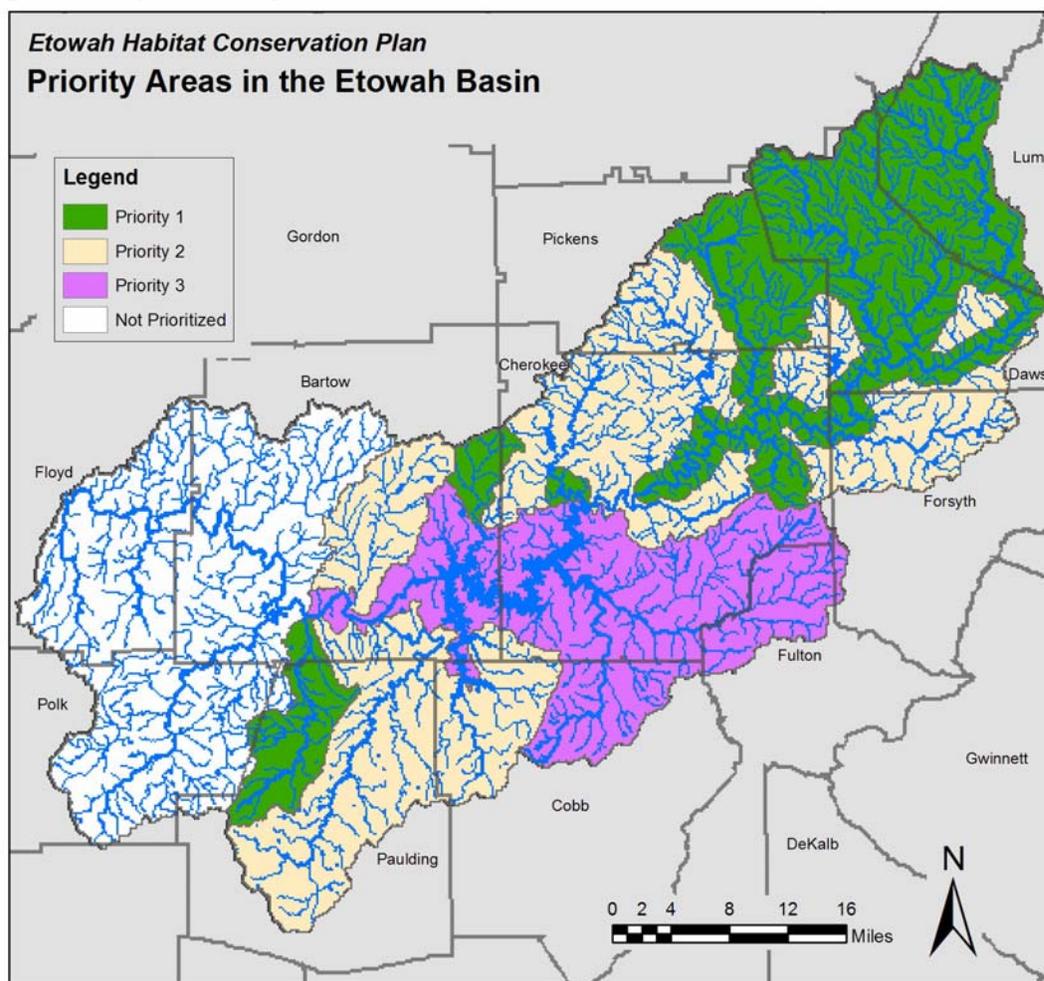
## ***Runoff Limits***

The HCP stormwater ordinance's major departure from the Metro District is in the provisions for Runoff Limits, which apply to Priority Areas 1 and 2.

The Runoff Limits Program identifies three Priority Areas in the Etowah watershed, which are defined by the distribution of imperiled fish species. Priority 1 areas are subwatersheds that support the most sensitive imperiled fishes and therefore are subject to the strictest Runoff Limits. Priority 2 areas, which have slightly less restrictive limits, are important for protecting downstream habitat and populations of imperiled fishes that are less sensitive. Priority 3 areas support few or no imperiled species and are not required to meet Runoff Limits in order to comply with the Etowah Aquatic HCP. Local governments can also establish development nodes within Priority 1 and Priority 2 areas to make it cheaper and easier to construct commercial, industrial and high-density residential development. Development nodes have much less restrictive Runoff Limits. The amount of land in development nodes must be limited, however, to ensure that impacts to the imperiled fish are not excessive.

The Runoff Limit for a site in a Priority 1 area is equal to that of an undeveloped, forested site for the two-year design storm. That is, the volume of runoff for the site must not exceed the volume of runoff that would occur under a forested condition, for small storms, given the soils present. The Runoff Limit for a site in a Priority 2 area is set at the equivalent of 5% impervious cover. Therefore, new development and major redevelopment must employ stormwater management practices that make the site act as if it had no more than 5% impervious cover (and the remainder forested). The Runoff Limit for a development node is set at 50% of the actual impervious cover for the site. For example, a site with 60% impervious cover must reduce the runoff to the amount expected from the site if it had only 30% impervious cover (and the remainder forested).

**Figure 2. Map of Priority Areas.**



### **Development Nodes**

The size of development nodes must be limited to ensure that impacts to imperiled fish species are minimal and localized. The development node Runoff Limit performance standard was designed to be readily achievable and allow a reasonable acreage to be included in nodes without causing degradation of habitat. It is possible for jurisdictions to use a stricter Runoff Limits performance standard for nodes (for example, 1/3 the actual impervious cover), which would allow a larger node area; alternatively, jurisdictions could adopt a more lenient standard, which would require a node area to be further restricted in size. However, the 50% standard is recommended for adoption by all jurisdictions for consistency and simplicity.

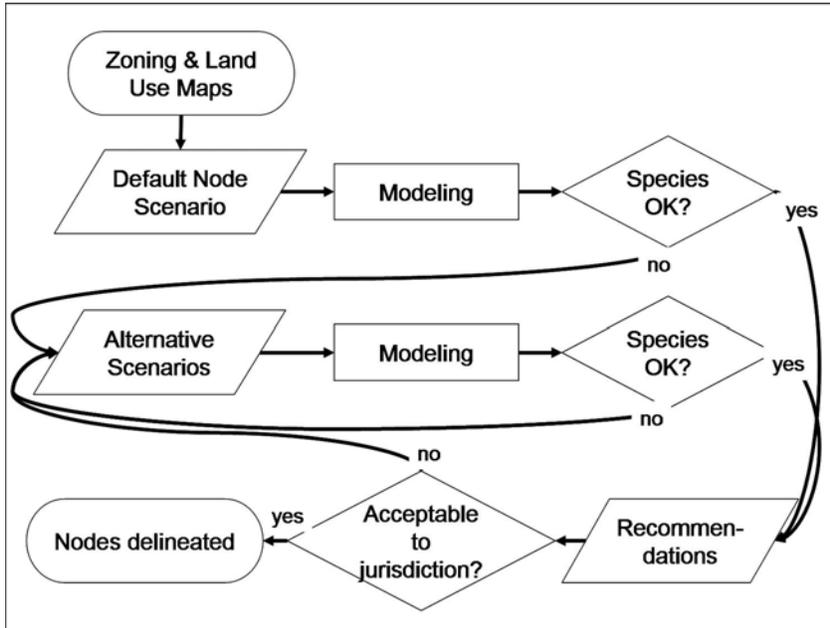
Establishing development node boundaries means determining which parcels or portions of parcels are formally designated as development nodes. These parcels are mapped on an official Priority Areas and Development Node Map (“node map”), which must be adopted by each local government as an appendix to its stormwater ordinance. Local governments decide where to locate development nodes, and they may modify node locations in the future. However, node designations are subject to two critical constraints: (1) a node map cannot result

in a predicted loss of habitat that exceeds the species “population thresholds” established under the Etowah Aquatic HCP and (2) a node map cannot result in take that exceeds the terms of the Incidental Take Permit (ITP) issued to the jurisdiction as part of the Etowah Aquatic HCP.

To test whether a proposed node map or change to a node map meets these conditions, the Etowah Aquatic HCP Species Predictive Occurrence and Abundance Model (“model”) must be run. This model estimates the future occurrence probability of Etowah darters and amber darters and the future abundance of Cherokee darters, given a buildout scenario based on the proposed node map. These predicted values must meet the minimum population thresholds established for each of the species by the Etowah Aquatic HCP Scientific Advisory Committee (see “population thresholds” below). To determine the total amount of species loss or take, the predictions are compared to the 2006 occurrence probability and abundance values (also called the baseline values). The decline from 2006 to the predicted values is the take, which cannot exceed the amount authorized in the ITP.

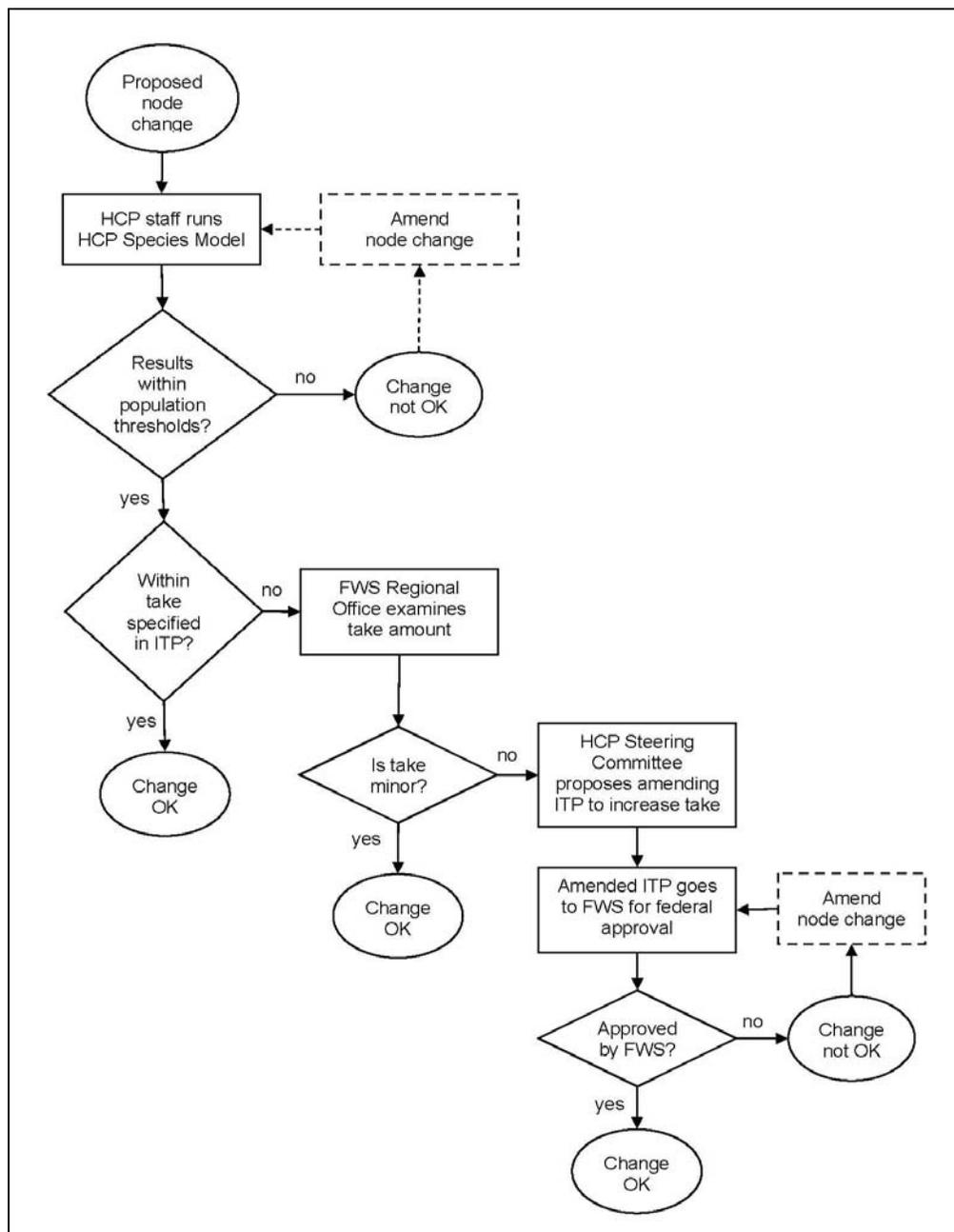
Of these two criteria, the population thresholds are the more critical. The population thresholds represent minimum levels of occupancy and abundance that must be maintained by the three federally listed species across their ranges; if the species fall below these thresholds, their survival and recovery may be jeopardized (for more details, see the Etowah Aquatic HCP document). The U.S. Fish and Wildlife Service (USFWS) will likely consider these thresholds in evaluating all future activities in the Etowah, not just development nodes under the Etowah Aquatic HCP. The ITPs for individual jurisdictions, by contrast, can be amended to increase the amount of specified take as long as the population thresholds are met. Review of the level of take in the ITPs will happen on a periodic basis (at least every five years) or can be initiated more frequently if one or more jurisdictions wish to expand their development nodes and increase the total amount of take. The initial levels of take specified in the ITPs are based on the mapped development nodes at the time of adoption of the Etowah Aquatic HCP. These development nodes were identified by participating counties and municipalities working cooperatively with the Etowah Aquatic HCP Advisory Committee and were based on zoning maps and comprehensive plans. In some cases, preliminary modeling of a proposed set of nodes indicated that species losses would exceed the population thresholds, indicating that modifications to the node maps were necessary. In each case an agreement was reached on a node map that met the needs of the jurisdiction and did not exceed the population thresholds (Figure 3). In cases where species losses were within the population thresholds, some jurisdictions added additional potential development nodes to account for future growth beyond what was indicated in zoning and future land use maps. These nodes might not be formally mapped immediately for practical reasons, but the ITPs for those jurisdictions reflect the potential to expand the nodes if necessary.

**Figure 3. Procedure Used to Delineate Initial Development Node Maps.** County and municipal zoning and existing and future land use maps were used to develop the default node scenario for each jurisdiction. If predictive modeling showed that the population thresholds were met, the scenario was used to guide the mapping of nodes. Otherwise, alternative scenarios were developed and modeled to find one or more that resulted in acceptable levels of species loss, while also meeting the needs of the jurisdiction.



Proposed future changes to development node maps must be evaluated to determine whether they are consistent with both the population thresholds and the total take authorized in the ITP for each jurisdiction (Figure 4).

**Figure 4. Procedures Used to Amend Development Node Maps.** Proposed changes to development node maps must be evaluated using the Etowah Aquatic HCP Species Predictive Occurrence and Abundance Model. The results must be consistent with the population thresholds; if not, the node change will need to be amended. The take must also be within the limits specified in the jurisdiction's ITP. However, if the additional take is minor, the USFWS Regional Office can authorize the change. If the additional take is significant, the Steering Committee will need to vote to amend the ITP to authorize the additional amount. This requires federal approval, which takes time, but is likely to be given if the action is consistent with the population thresholds.



## ***Calculating Runoff Volumes***

Estimating the runoff volumes under forested and developed conditions requires only simple, commonly-employed hydrologic modeling based on the Soil Conservation Service Runoff Curve Number method (SCS 1986). Curve numbers are a measure of the runoff potential of a site with higher curve numbers used for surfaces that produce more runoff given local soil conditions. Impervious surfaces are given a curve number of 98. The curve number of a forested site in good condition with type “C” soils—typical of the Etowah—is 70. These numbers are used in an equation to estimate the volume of runoff for storms of different sizes.

Applying the performance standard to a site is a straightforward three-step process:

- (1) Calculate the volume of runoff from the site using the curve number of a forest in good condition and existing soils on site for the regional two-year, 24-hour design storm. This is the Runoff Limit.
- (2) Calculate the volume of runoff from the site using the curve numbers of the post-development conditions for the regional two-year, 24-hour design storm.
- (3) If the volume from step two exceeds the Runoff Limit from step one, then use best management practices to decrease the volume so that it meets the limit. Practices can include implementation of better site design principles to reduce the volume of stormwater generated and use of infiltration and evapotranspiration stormwater structures to return the runoff to the soil or the air.

The above procedure applies to Priority 1 areas. The same procedure is used for Priority 2 areas and development nodes except that the calculation in step one is modified appropriately to represent the relaxed Runoff Limits in those areas. Detailed instructions on calculations, including examples, will be provided in the Runoff Limits Manual.

The HCP Ordinance requires the use of a forested condition as the basis for the Runoff Limit calculation in step one, rather than current conditions. This management decision was discussed at length by technical committee members, some of whom favored the use of current conditions as a baseline because it would apply a lower standard to sites currently in agricultural use. After extensive debate, the Technical and Steering Committees agreed to use a forested condition as a baseline because it provides necessary protection for the imperiled fishes and allows for potential recovery in areas that may have been previously degraded by agriculture. In addition, areas of a development site that are not disturbed do not need to be included in the calculation, which alleviated a concern of some committee members.

Two additional standards apply to the design of stormwater management systems under the Runoff Limits Program:

- The treatment system must be designed so that all stormwater runoff from impervious surfaces is directed to on-site stormwater controls. It is not acceptable for runoff from a part of a site to be shunted offsite without the opportunity to pass through infiltration BMPs. This applies to development nodes as well as priority areas.
- Runoff shall be managed as close as possible to the point where it is generated, using many small structures rather than few large structures, to the extent feasible.

The treatment system can (and should) be designed in a way that meets the other performance standards of the Etowah Aquatic HCP stormwater ordinance in one integrated

system. Generally, designing a system in a Priority 1 or Priority 2 area to meet the Runoff Limits standard will meet the standards for water quality and channel protection as well without the need for additional BMPs (this may not be true in development nodes). Currently, however, engineering calculations are still required to ensure that the water quality and channel protection standards are in fact met; this is especially important in Metro District jurisdictions to meet District requirements. However, HCP staff are researching whether it is possible to formally waive water quality, channel protection and even flood protection requirements for sites that meet the standards for Priority 1 and Priority 2 areas. Such a waiver would save considerable engineering time and expense (this is not essential for the HCP, but would provide a benefit to developers).

### ***Engineering Specifications for Structural BMPs***

For developers to effectively meet Runoff Limits, they must have access to good engineering design specifications for infiltration and evapotranspiration stormwater BMPs. The Georgia Stormwater Management Manual has specifications for some of these, including infiltration trenches and bioretention areas but the specifications for these controls are not targeted towards stormwater volume control. Other manuals add additional practices, such as dry wells, infiltration basins and vegetated roof cover. Further resources are available from independent sources, such as the Center for Watershed Protection. The technical committee has assembled the best and most relevant of these engineering specifications for inclusion in the Etowah Aquatic HCP Runoff Limits Manual. The Runoff Limits Manual will help ensure that BMPs are designed to meet the performance standards and match the goals of the Runoff Limits program.

### ***Non-Structural Stormwater BMPs and Better Site Design Guidelines***

The goals of non-structural, Better Site Design techniques are to reduce the overall volume of runoff generated by developed areas by reducing impervious surfaces and facilitating infiltration of runoff as close to its source as possible by incorporating natural hydrological features such as topography and soil structure into development designs. This approach emphasizes site planning techniques to conserve natural areas and the hydrologic function of a site (Center for Watershed Protection 1998, 1999). Planning in this way involves a slightly different approach than traditional site planning. Better Site Design practices are most effective when planners begin designing their sites by first identifying areas of the site with hydrological significance; that is, areas where development should be avoided because the impacts of stormwater will be difficult to manage or areas where stormwater collects and infiltrates naturally and that can be incorporated into the project's stormwater management plan. Once these areas are identified site design plans and construction on the ground should include Better Site Design practices and non-structural stormwater controls in conjunction with these areas.

Table 3 lists several examples of non-structural, Better Site Design practices. More detailed specifications and design criteria, as well as a variety of other techniques, are listed in the Runoff Limits Manual. These techniques are not mandatory and their application should be based on local conditions.

Because non-structural stormwater controls and Better Site Design approaches diverge from traditional methods of stormwater management, many non-structural BMPs and Better Site Design practices are prohibited by local ordinances and building codes. Therefore, some jurisdictions may need to revise development regulations to allow the use of some practices. The Code and Ordinance Worksheet (Appendix A-2) can be used to identify which codes need

to be revised in each jurisdiction. The Land Use Clinic at the University of Georgia School of Law is available to help local governments review and revise their development regulations.

**Table 3. Examples of Non-structural Stormwater Management BMPs and Better Site Design Practices.**

Better Site Design Techniques	Example Design Specifications and Ordinance Components
Base residential street widths on minimum required width for emergency vehicles, school buses, and on-street parking (if allowed).	Set a maximum pavement width for residential streets: <ul style="list-style-type: none"> <li>• 24 ft (back of curb to back of curb) for road with parking on one side of street</li> <li>• 26 ft for road with parking on both sides of street</li> <li>• 20 ft for roads with no on-street parking</li> </ul>
Develop alternatives for managing runoff from roads that encourage treatment of stormwater runoff as close to the source as possible.	<ul style="list-style-type: none"> <li>• Use roll top curbs that allow sheet flow into adjacent swales or infiltration areas.</li> <li>• Allow planting strip designs that use amended soil that promotes both plant health and stormwater infiltration.</li> </ul> Allow designs with or without curb & gutter. <ul style="list-style-type: none"> <li>• Use permeable pavements for low traffic areas (on-street parking, sidewalks).</li> <li>• Use tree pits as infiltration areas.</li> </ul>
Minimize the number and radii of residential street cul-de-sacs and incorporate landscaped areas to reduce their imperviousness. Alternative turnarounds should be considered.	<ul style="list-style-type: none"> <li>• Recommend 35 ft or minimum required for emergency vehicles turning radius on cul-de-sacs.</li> <li>• Allow alternatives to cul-de-sacs, such as hammerheads and loop roads.</li> <li>• Allow vegetated islands in the center of cul-de-sacs that can be used to infiltrate runoff.</li> </ul>
Advocate open space development incorporating smaller lot sizes to minimize total impervious area, reduce total construction costs, conserve natural areas, provide community recreational space, and promote watershed protection.	<ul style="list-style-type: none"> <li>• Make cluster development by-right; do not require additional plan review and public hearings.</li> <li>• Allow reduced lot size for detached housing on public water and sewer, with the condition that the applicant must demonstrate a workable design that does not increase yield allowed by zoning.</li> <li>• Relax permit fee requirements for cluster submittals.</li> </ul> Consider providing incentives to encourage clustering.
Relax side yard setbacks and allow narrower frontages to reduce total road length in the community and overall site imperviousness. Relax front setback requirements to minimize driveway lengths and reduce overall lot imperviousness.	Consider setting maximum and minimum setbacks and frontages. The setbacks should be related to the methods chosen to treat street runoff (larger for streets using swales or bioretention, narrower for streets using curb & gutter).
Direct rooftop runoff to pervious areas such as yards, open channels, or vegetated areas and avoid routing rooftop runoff to the roadway and the stormwater conveyance system.	<ul style="list-style-type: none"> <li>• Disconnection of rooftop runoff must ensure no basement seepage or impacts to septic systems or wells.</li> <li>• The disconnection should drain continuously through a vegetated channel, swale, or filter strip to the property line or BMP.</li> <li>• Downspouts should be at least 10 feet away from the nearest impervious surface.</li> </ul>

The technical committee developed a Better Site Design Checklist (Appendix A-3) to assist builders and government staff in incorporating Better Site Design principles listed in the HCP

Runoff Limits Technical Manual into the site planning process. All jurisdictions are encouraged to use the checklist during builders' pre-construction stormwater consultations. The Better Site Design Checklist encourages site design professionals to consider a variety of techniques to reduce runoff, and choose those which are most appropriate and effective given site conditions.

### ***Maintenance of Stormwater Facilities***

Proper and regular inspection and maintenance of stormwater facilities, including structural and non-structural BMPs, was a major concern of the technical committee. The technical committee identified several problems associated with maintenance and, after discussion, developed proposed solutions outlined in Table 4.

**Table 4. Maintenance Problems and Solutions.**

<p><b>A. Problem:</b> Maintenance responsibility for many stormwater facilities is unassigned or unclear.  <b>Solution:</b> Assign clear responsibility. This may vary depending on the owner(s) of the facility; a recommended system is shown in the Table 2.</p>
<p><b>B. Problem:</b> There is no inspection of facilities to ensure that they are operational, or even still in existence.</p> <p><b>Solution:</b> Facilities serving 5,000 square feet or less impervious surface (which includes most homes) shall be inspected once every three years; facilities serving 5,001- 10,000 square feet impervious surface shall be inspected every two years; facilities serving more than 10,000 square feet impervious surface shall be inspected at least once a year. The inspection may be quick, sufficient to establish that the facility exists and is not obviously compromised.</p>
<p><b>C. Problem:</b> Even if facilities are failing or don't exist, the property owner doesn't fix them.  <b>Solution:</b> The property owner is given 30 days to correct this problem. If they fail to act, the jurisdiction corrects the problem and bills the owner.</p>
<p><b>D. Problem:</b> Homeowners' associations (HOAs) don't maintain their facilities and eventually dissolve.  <b>Solution:</b> Require the HOA to include provisions in their recorded declaration to Ensure that membership is mandatory, that the HOA has lien authority, that it maintains adequate funding at all times, and that it cannot dissolve without another entity accepting maintenance responsibility. Alternatively, the jurisdiction can accept all responsibility.</p>
<p><b>E. Problem:</b> Individual homeowners don't maintain their facilities and may even destroy them.  <b>Solution:</b> Inspections ensure that if facilities fall into disrepair they are replaced or corrected. The inspection/maintenance schedule is recorded on the deed and passed to future owners.</p>
<p><b>F. Problem:</b> There is insufficient funding for inspection and maintenance.  <b>Solution:</b> Establish a stormwater utility to provide adequate funding.</p>

The solutions to most of the problems rely on a system that assigns clear maintenance responsibility and establishes a system of inspections to ensure that maintenance is faithfully performed by the responsible party. A recommended system is shown in Table 5. Solutions to problems C, D and E, which provide mechanisms to compel compliance, promote longevity of HOAs and record maintenance requirements on deeds, have been incorporated into the Etowah Aquatic HCP stormwater ordinance, as described below. Formation of a stormwater utility to fund activities is optional but strongly encouraged.

**Table 5. Stormwater BMP Maintenance and Inspection Schedule**

Owner/Type	Minimum Inspection Frequency	BMP Maintenance Responsibility*
Facilities serving more than 20,000 sq. ft. impervious surface (Commercial and Industrial BMPs)	Annual	Owner
Facilities serving 5,001-20,000 sq. ft. impervious surface (Multi-Residence BMPs)	Every 2 years	HOA
Facilities serving less than 5,000 sq. ft. impervious surface (Individual Home BMPs)	Every 3 years	Owner
Government-Owned BMPs	Annual	Government

\*local governments may also choose to accept responsibility for BMP maintenance

**Comparison with Metro District Maintenance Standards**

The Metro District Stormwater Ordinance contains provisions for maintenance of stormwater management structures. However, these are limited in scope and do not address many of the concerns of the HCP Stormwater technical committee. Therefore, the HCP Technical Committee decided to write their proposed solutions to maintenance concerns into the ordinance. The following list outlines the HCP Ordinance’s amendments and additions to the Metro District Ordinance regarding maintenance and inspection. Section 7 of the HCP Model Stormwater Ordinance (Appendix A-1) also is pertinent.

1. Maintenance Agreement and Covenant
  - The name of the “Stormwater Management Inspection and Maintenance Agreement” has been changed throughout the ordinance to “Stormwater Management Inspection and Maintenance Agreement and Covenant.” This is a semantic change that will avoid confusion and legal challenges. Several other jurisdictions throughout the nation require covenants as part of the maintenance agreement. The covenant ensures that all subsequent property owners will be legally responsible for maintenance of BMPs on their properties.
  - Subsection 7.1 has been amended to clarify that repairs, restoration, and maintenance of stormwater facilities and BMPs must be done as specified in the Inspection and Maintenance Agreement and Covenant.
  
2. Standards for Homeowners’ Associations (HOAs)
  - Section 7.1 has been amended to require HOAs that are responsible for BMP maintenance to meet several standards. The declaration that forms the HOA must state that:
    - a. membership in the association shall be mandatory and automatic for all unit owners or homeowners of the development and their successors;
    - b. the association shall have lien authority to ensure the collection of dues from all members;
    - c. the facility or BMP is part of the developments’ common elements and shall be subject to the Inspection and Maintenance Agreement and Covenant;

- d. the requirements of the Inspection and Maintenance Agreement and Covenant shall receive the highest priority for expenditures by the association except for any other expenditures that are required by law to have a higher priority;
- e. a separate fund shall be maintained by the association for the routine maintenance, reconstruction and repair of the facilities and/or BMPs, separate from all other funds of the association that shall be kept in an account insured by the FDIC or by another entity acceptable to the local government;
- f. the routine maintenance, reconstruction, and repair fund shall contain at all times the dollar amount reasonably determined from time to time by local jurisdiction to be adequate to pay for the probable reconstruction and repair cost (but not routine maintenance cost) for a three-year period; and
- g. to the extent permitted by law, the association shall not enter into voluntary dissolution unless the facilities and/or BMPs are transferred to a successor owner.

### 3. Penalties

- Section 7.2. has been amended to state that the enforcement procedures found in Section 7.5 must be followed in all situations after a warning has been issued. The enforcement procedures found in Section 7.5 state that:
  - i. if the responsible party fails to repair the stormwater facility once a warning has been issued, the local jurisdiction can perform the necessary maintenance; and
  - ii. once maintenance has been performed, the local jurisdiction can assess the responsible party for the cost of repairs, which shall be a lien on the property, with such lien placed on the ad valorem tax bill and collected in the ordinary manner for such taxes.

### 4. Maintenance Inspections

- Subsection 7.2 has been amended to comply with the technical committee's recommendations for maintenance inspection frequency. The committee recommends that each jurisdiction establish an inspection program in which local officials inspect:
  - i. BMPs serving more than 20,000 sq. ft. of impervious cover inspected at least once per year;
  - ii. BMPs serving between 5,000 sq. ft. and 20,000 sq. ft. of impervious cover at least biennially (once every two years); and
  - iii. BMPs serving less than 5,000 sq. ft. of impervious cover at least triennially (once every three years). (This essentially covers all BMPs that serve individual residences, such as single family homes and duplexes).

### 5. Government Responsibility for BMP Maintenance

- The ordinance has been amended to require the owner of property that contains a stormwater facility or BMP to grant the local government an easement grant it access for maintenance if the government has agreed to accept maintenance responsibility. Any local government is free to deny requests of private landowners to take over maintenance responsibilities by not accepting any easements.

- Section 7.1 has been amended to state that, if the government chooses to accept maintenance responsibility for a stormwater BMP, and thus an easement for that BMP, then the BMP must be in proper working order at the time the easement is granted.

## Implementing the Stormwater Management Policy

It is the intent of the HCP Steering Committee that the Stormwater Management Policy be adopted by all jurisdictions participating in the HCP prior to receiving an Incidental Take Permit from US Fish and Wildlife Service, and that, once implemented, the policy will help minimize and mitigate take of imperiled aquatic species in the Etowah Watershed.

The following actions are **required** for all jurisdictions that include Priority 1 and Priority 2 areas:

- Adopt the Etowah Aquatic HCP Stormwater Ordinance (Appendix A-1). The ordinance must be adopted by all jurisdictions that include Priority 1 and Priority 2 areas. The ordinance may be adopted jurisdiction-wide or only in an overlay zone that includes only Priority 1 and Priority 2 areas. The Metro District ordinance is an acceptable alternative for Priority 3 areas.
- Adopt an official Priority Areas and Development Node Map. This is only necessary for jurisdictions that include Priority 1 and Priority 2 areas. The map is adopted as an addendum to the stormwater ordinance.

The following actions are **optional** for all jurisdictions:

- Amend development regulations to allow/encourage the use of Better Site Design techniques (see Appendix A-2).
- Use the Better Site Design Checklist in preconstruction stormwater consultations with developers and builders.
- Establish or amend a stormwater utility to provide funding for inspection and maintenance of stormwater facilities.

## Literature Cited

- Arnold, C. L. and C. J. Gibbons. 1996. Impervious surface coverage: the emergence of a key environmental indicator. *Journal of the American Planning Association* 62: 243- 258.
- Atlanta Regional Commission. 2001. *Georgia Stormwater Management Manual Volume 2: Technical Handbook*. Atlanta Regional Commission, Atlanta Georgia.  
<http://www.georgiastormwater.com>
- Booth, D. B. and C. R. Jackson. 1997. Urbanization of aquatic systems: degradation thresholds, stormwater detention, and the limits of mitigation. *Journal of the American Water Resources Association* 33: 1077-1090.
- Burchell, R. W. and S. Mukherji. Conventional development versus managed growth: the costs of sprawl. *American Journal of Public Health* 93: 1534-1540.
- Buzbee, W. W. 2003. Urban form, health, and the law's limits. *American Journal of Public Health* 93: 1395-1399.
- Center for Watershed Protection. 1998. *Better site design: a handbook for changing development rules in your community*. Center for Watershed Protection, Ellicott City, Maryland.
- Center for Watershed Protection. 1999. *Recommended model development principles for Frederick County, Maryland*. Center for Watershed Protection, Ellicott City, Maryland.
- Gaffield, S. J., R. L. Goo, L. A. Richards, and R. J. Jackson. Public health effects of inadequately managed stormwater runoff. *American Journal of Public Health* 93: 1527-1533.
- Georgia Environmental Protection Division. 2002. *Water Quality in Georgia 2000-2001*. Atlanta, Georgia.
- Klein, R. D. 1979. Urbanization and stream quality impairment. *Water Resources Bulletin* 15: 119-126.
- Paul, M. J. and J. L. Meyer. 2001. Streams in the urban landscape. *Annual Review of Ecology and Systematics*, 32: 333-365.
- Prince George's County. 1999. *Low-impact development design strategies: an integrated design approach*. Prince George's County Department of Environmental Resources Programs and Planning Division, Largo Maryland.
- Schueler, T. R. 1987. *Controlling urban runoff: a practical manual for planning and designing urban BMPs*. Metropolitan Washington Council of Governments, Washington D.C.
- Wang, L., J. Lyons, and P. Kanehl. 2001. Impacts of urbanization on stream habitat and fish across multiple spatial scales. *Environmental Management* 28: 255-266.
- Waters, T. F. 1995. *Sediment in streams: sources, biological effects, and control*. American Fisheries Society Monograph 7. American Fisheries Society, Bethesda, Maryland.

**Appendix 1**  
**Model Post Development Stormwater Ordinance**

# Model Post-Development Stormwater Management Ordinance

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## Introduction

It is hereby determined that:

Land development projects and other land use conversions, and their associated changes to land cover, permanently alter the hydrologic response of local watersheds and increase stormwater runoff rates and volumes, which in turn increase flooding, stream channel erosion, and sediment transport and deposition;

Land development projects and other land use conversions also contribute to increased nonpoint source pollution and degradation of receiving waters;

The impacts of post-development stormwater runoff quantity and quality can adversely affect public safety, public and private property, drinking water supplies, recreation, aquatic habitats, fish and other aquatic life, property values and other uses of lands and waters;

These adverse impacts can be controlled and minimized through the regulation of stormwater runoff quantity and quality from new development and redevelopment, by the use of both structural and nonstructural measures;

Control and minimization of the adverse impacts of post-development stormwater runoff is an integral part of the Etowah Habitat Conservation Plan, the purpose of which is to protect the imperiled species of the Etowah watershed pursuant to the federal Endangered Species Act;

Localities in the State of Georgia are required to comply with a number of both State and Federal laws, regulations and permits which require a locality to address the impacts of post-development stormwater runoff quality and nonpoint source pollution;

Therefore, the (*local jurisdiction*) has established this set of stormwater management policies to provide reasonable guidance for the regulation of post-development stormwater runoff for the purpose of protecting local water resources from degradation. It has determined that it is in the public interest to regulate post-development stormwater runoff discharges in order to control and minimize increases in stormwater runoff rates and volumes, post-construction soil erosion and sedimentation, stream channel erosion, and nonpoint source pollution associated with post-development stormwater runoff.

## **Section 1. General Provisions**

### **1.1. Purpose and Intent**

The purpose of this ordinance is to protect, maintain and enhance the public health, safety, environment and general welfare by establishing minimum requirements and procedures to control the adverse effects of increased post-development stormwater runoff and nonpoint source pollution associated with new development and redevelopment. It has been determined that proper management of post-development stormwater runoff will minimize damage to public and private property and infrastructure, safeguard the public health, safety, environment and general welfare of the public, and protect water and aquatic resources. This ordinance seeks to meet that purpose through the following objectives:

- (1) Establish decision-making processes surrounding land development activities that protect the integrity of the watershed and preserve the health of water resources;
- (2) Require that new development and redevelopment maintain the pre-development hydrologic response in their post-development state as nearly as practicable in order to reduce flooding, streambank erosion, nonpoint source pollution and increases in stream temperature, and maintain the integrity of stream channels and aquatic habitats;
- (3) Establish minimum post-development stormwater management standards and design criteria for the regulation and control of stormwater runoff quantity and quality;
- (4) Establish design and application criteria for the construction and use of structural stormwater control facilities that can be used to meet the minimum post-development stormwater management standards;
- (5) Encourage the use of nonstructural stormwater management and stormwater better site design practices, such as reducing impervious cover and the preservation of greenspace and other natural areas, to the maximum extent practicable. Coordinate site design plans, which include greenspace, with the county's greenspace protection plan;
- (6) Establish provisions for the long-term responsibility for and maintenance of structural stormwater control facilities and nonstructural stormwater management practices to ensure that they continue to function as designed, are maintained, and pose no threat to public safety; and,
- (7) Establish administrative procedures for the submission, review, approval and disapproval of stormwater management plans, and for the inspection of approved active projects, and long-term follow up.

### **1.2. Applicability**

- (1) This ordinance shall be applicable to all land development, including, but not limited to, site plan applications, subdivision applications, and grading applications, unless exempt pursuant to Subsection 2 below. These standards apply to any new development or redevelopment site that meets one or more of the following criteria:
  - a. New development that involves the creation of 5,000 square feet or more of impervious cover, or that involves other land development activities of 1 acre or more;

- b. Redevelopment that includes the creation, addition or replacement of 5,000 square feet or more of impervious cover, or that involves other land development activity of one (1) acre or more;
  - c. Any new development or redevelopment, regardless of size, that is defined by the (*administrator*) to be a hotspot land use; or,
  - d. Land development activities that are smaller than the minimum applicability criteria set forth in items A and B above if such activities are part of a larger common plan of development, even though multiple, separate and distinct land development activities may take place at different times on different schedules.
- (2) The following activities are exempt from this ordinance:
- a. Individual single-family or duplex residential lots that are not part of a subdivision or phased development project;
  - b. Additions or modifications to existing single-family or duplex residential structures;
  - c. Agricultural or silvicultural land management activities within areas zoned for these activities; and,
  - d. Repairs to any stormwater management facility or practice deemed necessary by the (*administrator*).
  - e. Single-family or duplex residential lots platted prior to the adoption of this ordinance, whether or not they are part of a subdivision or phased development project.
  - f. Redevelopment that constitutes the replacement of the original square footage of impervious cover and original acreage of other land development activity when the original development is wholly or partially lost due to natural disaster or other acts of God occurring after [date of adoption].
- (3) Additional requirements apply to all parcels located within areas identified as Priority 1 Areas, Priority 2 Areas and Development Node Areas on the (*local jurisdiction*) Priority Area and Development Node Map, as indicated in Section 5 herein.

### **1.3. Designation of Ordinance Administrator**

The (*title of administrator*) or (*designee*) is hereby appointed to administer and implement the provisions of this ordinance.

### **1.4. Compatibility with Other Regulations**

This ordinance is not intended to modify or repeal any other ordinance, rule, regulation or other provision of law. The requirements of this ordinance are in addition to the requirements of any other ordinance, rule, regulation or other provision of law, and where any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule, regulation or other provision of law, whichever provision is more restrictive or imposes higher protective standards for human health or the environment shall control.

## 1.5. Severability

If the provisions of any section, subsection, paragraph, subdivision or clause of this ordinance shall be adjudged invalid by a court of competent jurisdiction, such judgment shall not affect or invalidate the remainder of any section, subsection, paragraph, subdivision or clause of this ordinance.

## 1.6. Stormwater Management Manual

The (*local jurisdiction*) will utilize the policy, criteria and information including technical specifications and standards in the latest edition of the Georgia Stormwater Management Manual and any relevant local addenda for the proper implementation of the requirements of this ordinance. The manual may be updated and expanded periodically, based on improvements in science, engineering, monitoring and local maintenance experience.

## Section 2. Definitions

**“Applicant”** means a person submitting a post-development stormwater management application and plan for approval.

**“Better Site Design”** means site design approaches and techniques that can reduce a site’s impact on the watershed and can provide for nonstructural stormwater management. Better site design includes conserving and protecting natural areas and greenspace, reducing impervious cover, and using natural features for stormwater management.

**“Channel”** means a natural or artificial watercourse with a definite bed and banks that conducts continuously or periodically flowing water.

**“Conservation Easement”** means an agreement between a land owner and the (*local jurisdiction*) or other government agency or land trust that permanently protects open space or greenspace on the owner’s land by limiting the amount and type of development that can take place, but continues to leave the remainder of the fee interest in private ownership.

**“Detention”** means the temporary storage of stormwater runoff in a stormwater management facility for the purpose of controlling the peak discharge.

**“Detention Facility”** means a detention basin or structure designed for the detention of stormwater runoff and gradual release of stored water at controlled rates.

**“Developer”** means a person who undertakes land development activities.

**“Development”** means a land development or land development project.

**“Drainage Easement”** means an easement appurtenant or attached to a tract or parcel of land allowing the owner of adjacent tracts or other persons to discharge stormwater runoff onto the tract or parcel of land subject to the drainage easement.

**“Erosion and Sedimentation Control Plan”** means a plan that is designed to minimize the accelerated erosion and sediment runoff at a site during land disturbance activities.

**“Evapotranspiration”** means the loss of water to the atmosphere by both evaporation and transpiration, which is the evaporation of water by plants.

**“Extended Detention”** means the detention of stormwater runoff for an extended period, typically 24 hours or greater.

**“Extreme Flood Protection”** means measures taken to prevent adverse impacts from large low-frequency storm events with a return frequency of 100 years or more.

**“Flooding”** means a volume of surface water that is too great to be confined within the banks or walls of a conveyance or stream channel and that overflows onto adjacent lands.

**“Greenspace”** or **“Open Space”** means permanently protected areas of the site that are preserved in a natural state.

**“Hotspot”** means an area where the use of the land has the potential to generate highly contaminated runoff, with concentrations of pollutants in excess of those typically found in stormwater. Hotspots may be permanent or temporary. Hotspots include, but are not limited to, fueling stations (including temporary fueling stations during construction) and golf courses.

**“Hydrologic Soil Group (HSG)”** means a Natural Resource Conservation Service classification system in which soils are categorized into four runoff potential groups. The groups range from group A soils, with high permeability and little runoff produced, to group D soils, which have low permeability rates and produce much more runoff.

**“Impervious Cover”** means a surface composed of any material that greatly impedes or prevents the natural infiltration of water into soil. Impervious surfaces include, but are not limited to, rooftops, buildings, streets and roads, except those designed specifically to allow infiltration.

**“Industrial Stormwater Permit”** means a National Pollutant Discharge Elimination System (NPDES) permit issued to an industry or group of industries which regulates the pollutant levels associated with industrial stormwater discharges or specifies on-site pollution control strategies.

**“Infiltration”** means the process of percolating stormwater runoff into the subsoil.

**“Inspection and Maintenance Agreement and Covenant”** means a written agreement and covenant providing for the long-term inspection and maintenance of stormwater management facilities and practices on a site or with respect to a land development project, which when properly recorded in the deed records constitutes a restriction on the title to a site or other land involved in a development project.

**“Jurisdictional Wetland”** means an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation.

**“Land Development”** means any land change, including, but not limited to, clearing, digging, grubbing, stripping, removal of vegetation, dredging, grading, excavating, transporting and filling of land, construction, paving, and any other installation of impervious cover.

**“Land Development Activities”** means those actions or activities which comprise, facilitate or result in land development.

**“Land Development Project”** means a discrete land development undertaking.

**“Inspection and Maintenance Agreement and Covenant”** means a written agreement and covenant providing for the long-term inspection and maintenance of stormwater management facilities and practices on a site or with respect to a land development project, which when properly recorded in the deed records constitutes a restriction on the title to a site or other land involved in a land development project.

**“New Development”** means a land development activity on a previously undeveloped site.

**“Nonpoint Source Pollution”** means a form of water pollution that does not originate from a discrete point such as a sewage treatment plant or industrial discharge, but involves the transport of pollutants such as sediment, fertilizers, pesticides, heavy metals, oil, grease, bacteria, organic materials and other contaminants from land to surface water and groundwater via mechanisms such as precipitation, stormwater runoff, and leaching. Nonpoint source pollution is a by-product of land use practices such as agricultural, silvicultural, mining, construction, subsurface disposal and urban runoff sources.

**“Nonstructural Stormwater Management Practice”** or **“Nonstructural Practice”** means any natural or planted vegetation or other nonstructural component of the stormwater management plan that provides for or enhances stormwater quantity and/or quality control or other stormwater management benefits, and includes, but is not limited to, riparian buffers, open and greenspace areas, overland flow filtration areas, natural depressions, and vegetated channels.

**“Off-Site Facility”** means a stormwater management facility located outside the boundaries of the site.

**“On-Site Facility”** means a stormwater management facility located within the boundaries of the site.

**“Overbank Flood Protection”** means measures taken to prevent an increase in the frequency and magnitude of out-of-bank flooding (i.e. flow events that exceed the capacity of the channel and enter the floodplain), and that are intended to protect downstream properties from flooding for the 2-year through 25-year frequency storm events.

**“Owner”** means the legal or beneficial owner of a site, including but not limited to, a mortgagee or vendee in possession, receiver, executor, trustee, lessee or other person, firm or corporation in control of the site.

**“Permit”** means the permit issued by the (*local jurisdiction*) to the applicant which is required for undertaking any land development activity.

**“Person”** means, except to the extent exempted from this ordinance, any individual, partnership, firm, association, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, utility, cooperative, city, county or other political subdivision of the State, any interstate body or any other legal entity.

**“Post-development”** refers to the time period, or the conditions that may reasonably be expected or anticipated to exist, after completion of the land development activity on a site as the context may require.

**“Pre-development”** refers to the time period, or the conditions that exist, on a site prior to the commencement of a land development project and at the time that plans for the land development of a site are approved by the plan approving authority. Where phased development or plan approval occurs (preliminary grading, roads and utilities, etc.), the existing conditions at the time prior to the first item being approved or permitted shall establish pre-development conditions.

**“Project”** means a land development project.

**“Redevelopment”** means a land development project on a previously developed site, but excludes ordinary maintenance activities, remodeling of existing buildings, resurfacing of paved areas, and exterior changes or improvements which do not materially increase or concentrate stormwater runoff, or cause additional nonpoint source pollution.

**“Regional Stormwater Management Facility”** or **“Regional Facility”** means stormwater management facilities designed to control stormwater runoff from multiple properties, where the owners or developers of the individual properties may assist in the financing of the facility, and the requirement for on-site controls is either eliminated or reduced.

**“Runoff”** means stormwater runoff.

**“Site”** means the parcel of land being developed, or the portion thereof on which the land development project is located.

**“Stormwater Best Management Practice (BMP)”** means structural and nonstructural practices that control stormwater runoff and provide for or enhance stormwater quantity and/or quality control or other stormwater management benefits.

**“Stormwater Management”** means the collection, conveyance, storage, treatment and disposal of stormwater runoff in a manner intended to prevent increased flood damage, streambank channel erosion, habitat degradation and water quality degradation, and to enhance and promote the public health, safety and general welfare.

**“Stormwater Management Facility”** means any infrastructure that controls or conveys stormwater runoff.

**“Stormwater Management Measure”** means any stormwater management facility or nonstructural stormwater practice.

**“Stormwater Management Plan”** means a document describing how existing runoff characteristics will be affected by a land development project and containing measures for complying with the provisions of this ordinance.

**“Stormwater Management System”** means the entire set of structural and nonstructural stormwater management facilities and practices that are used to capture, convey and control the quantity and quality of the stormwater runoff from a site.

**“Stormwater Retrofit”** means a stormwater management practice designed for a currently developed site that previously had either no stormwater management practice in place or a practice inadequate to meet the stormwater management requirements of the site.

**“Stormwater Runoff”** means the flow of surface water resulting from precipitation.

**“Structural Stormwater Control”** means a structural stormwater management facility or device that controls stormwater runoff and changes the characteristics of that runoff including, but not limited to, the quantity and quality, the period of release or the velocity of flow of such runoff.

**“Subdivision”** means the division of a tract or parcel of land resulting in one or more new lots or building sites for the purpose, whether immediately or in the future, of sale, other transfer of ownership or land development, and includes divisions of land resulting from or made in connection with the layout or development of a new street or roadway or a change in an existing street or roadway.

## **Section 3. Permit Procedures and Requirements**

### **3.1. Permit Application Requirements**

No owner or developer shall perform any land development activities without first meeting the requirements of this ordinance prior to commencing the proposed activity.

Unless specifically exempted by this ordinance, any owner or developer proposing a land development activity shall submit to the (*local jurisdiction*) a permit application on a form provided by the (*local jurisdiction*) for that purpose.

Unless otherwise exempted by this ordinance, the following items shall accompany a permit application in order to be considered:

- (1) Stormwater concept plan and consultation meeting certification in accordance with Section 3.2;
- (2) Stormwater management plan in accordance with Section 3.3;
- (3) Inspection and maintenance agreement and covenant in accordance with Section 3.4, if applicable;
- (4) Performance bond in accordance with Section 3.5; and,
- (5) Permit application and plan review fees in accordance with Section 3.6.

### **3.2. Stormwater Concept Plan and Consultation Meeting**

Before any stormwater management permit application is submitted, it is recommended that the landowner or developer meet with the (*local jurisdiction*) for a consultation meeting on a preliminary concept plan for the post-development stormwater management system to be utilized in the proposed land development project. This consultation meeting shall take place at the time of the preliminary plan of subdivision or other early step in the development process.

The purpose of this meeting is to discuss the post-development stormwater management measures necessary for the proposed project, as well as to discuss and assess constraints, opportunities and potential ideas for stormwater management designs before the formal site design engineering is commenced.

To accomplish this goal the following information shall be included in the concept plan which shall be submitted in advance of the meeting:

A. Existing Conditions / Proposed Site Plans

Existing conditions and proposed site layout sketch plans, which illustrate at a minimum: existing and proposed topography; perennial and intermittent streams; mapping of predominant soils from soil surveys (when available); boundaries of existing predominant vegetation and proposed limits of clearing and grading; and location of existing and proposed roads, buildings, parking areas, existing easements, and other impervious surfaces.

B. Natural Resources Inventory

A written or graphic inventory of the natural resources at the site and surrounding area as it exists prior to the commencement of the project. This description should include a discussion of soil conditions, forest cover, topography, wetlands, and other native vegetative areas on the site, as well as the location and boundaries of other natural feature protection and conservation areas such as wetlands, lakes, ponds, floodplains, stream buffers and other setbacks (e.g., drinking water well setbacks, septic setbacks, etc.). Particular attention should be paid to environmentally sensitive features that provide particular opportunities or constraints for development.

C. Stormwater Management System Concept Plan

A written or graphic concept plan of the proposed post-development stormwater management system including: preliminary selection and location of proposed structural stormwater controls; a completed Site Design Checklist for Developers; location of existing and proposed conveyance systems such as grass channels, swales, and storm drains; flow paths; location of floodplain/floodway limits; relationship of site to upstream and downstream properties and drainages; and preliminary location of proposed stream channel modifications, such as bridge or culvert crossings.

Local watershed plans, the (*local jurisdiction*) greenspace projection plan (if applicable), and any relevant resource protection plans will be consulted in the discussion of the concept plan. If necessary, a follow-up meeting may be held to verify the post-development stormwater management measures necessary for the proposed project before formal design commences.

### **3.3. Stormwater Management Plan Requirements**

The stormwater management plan shall detail how post-development stormwater runoff will be controlled or managed and how the proposed project will meet the requirements of this ordinance, including the performance criteria set forth in Section 4 below.

This plan shall be in accordance with the criteria established in this section and must be submitted with the stamp and signature of a Professional Engineer (PE) licensed in the state of Georgia, who must verify that the design of all stormwater management facilities and practices

meet the submittal requirements outlined in the submittal checklist(s) found in the Georgia Stormwater Management Manual.

The stormwater management plan must ensure that the requirements and criteria in this ordinance are being complied with and that opportunities are being taken to minimize adverse post-development stormwater runoff impacts from the development. The plan shall consist of maps, narrative, and supporting design calculations (hydrologic and hydraulic) for the proposed stormwater management system. The plan shall include all of the information required in the Stormwater Management Site Plan checklist found in the Georgia Stormwater Management Manual. This includes:

A. Common address and legal description of site

B. Vicinity Map

C. Existing Conditions Hydrologic Analysis

The existing condition hydrologic analysis for stormwater runoff rates, volumes, and velocities, which shall include: a topographic map of existing site conditions with the drainage basin boundaries indicated; acreage, soil types and land cover of areas for each sub-basin affected by the project; all perennial and intermittent streams and other surface water features; all existing stormwater conveyances and structural control facilities; direction of flow and exits from the site; analysis of runoff provided by off-site areas upstream of the project site; and methodologies, assumptions, site parameters and supporting design calculations used in analyzing the existing conditions site hydrology. For redevelopment sites, predevelopment conditions shall be modeled using the established guidelines for the portion of the site undergoing land development activities.

D. Post-Development Hydrologic Analysis

The post-development hydrologic analysis for stormwater runoff rates, volumes, and velocities, which shall include: a topographic map of developed site conditions with the post-development drainage basin boundaries indicated; total area of post-development impervious surfaces and other land cover areas for each sub-basin affected by the project; calculations for determining the runoff volumes that need to be addressed for each sub-basin for the development project to meet the post-development stormwater management performance criteria in Section 4; location and boundaries of proposed natural feature protection and conservation areas; documentation and calculations for any applicable site design credits that are being utilized; methodologies, assumptions, site parameters and supporting design calculations used in analyzing the existing conditions site hydrology. If the land development activity on a redevelopment site constitutes more than 50 percent of the site area for the entire site, then the performance criteria in Section 4 must be met for the stormwater runoff from the entire site.

E. Stormwater Management System

The description, scaled drawings and design calculations for the proposed post-development stormwater management system, which shall include: A map and/or drawing or sketch of the stormwater management facilities, including the location of nonstructural site design features and the placement of existing and proposed structural stormwater controls, including design water surface elevations, storage volumes available from zero to maximum head, location of inlet and outlets, location of bypass and discharge systems, and all orifice/restrictor sizes; a narrative describing how the

selected structural stormwater controls will be appropriate and effective; cross-section and profile drawings and design details for each of the structural stormwater controls in the system, including supporting calculations to show that the facility is designed according to the applicable design criteria; a hydrologic and hydraulic analysis of the stormwater management system for all applicable design storms (including stage-storage or outlet rating curves, and inflow and outflow hydrographs); documentation and supporting calculations to show that the stormwater management system adequately meets the post-development stormwater management performance criteria in Section 4; drawings, design calculations, elevations and hydraulic grade lines for all existing and proposed stormwater conveyance elements including stormwater drains, pipes, culverts, catch basins, channels, swales and areas of overland flow; and where applicable, a narrative describing how the stormwater management system corresponds with any watershed protection plans and/or local greenspace protection plan.

#### F. Post-Development Downstream Analysis

A downstream peak flow analysis which includes the assumptions, results and supporting calculations to show safe passage of post-development design flows downstream. The analysis of downstream conditions in the report shall address each and every point or area along the project site's boundaries at which runoff will exit the property. The analysis shall focus on the portion of the drainage channel or watercourse immediately downstream from the project. This area shall extend downstream from the project to a point in the drainage basin where the project area is 10 percent of the total basin area. In calculating runoff volumes and discharge rates, consideration may need to be given to any planned future upstream land use changes. The analysis shall be in accordance with the Georgia Stormwater Management Manual.

#### G. Construction-Phase Erosion and Sedimentation Control Plan

An erosion and sedimentation control plan in accordance with the Georgia Erosion and Sedimentation Control Act or NPDES Permit for Construction Activities. The plan shall also include information on the sequence/phasing of construction and temporary stabilization measures and temporary structures that will be converted into permanent stormwater controls.

#### H. Landscaping and Greenspace Plan

A detailed landscaping and vegetation plan describing the woody and herbaceous vegetation that will be used within and adjacent to stormwater management facilities and practices. The landscaping plan must also include: the arrangement of planted areas, natural and greenspace areas and other landscaped features on the site plan; information necessary to construct the landscaping elements shown on the plan drawings; descriptions and standards for the methods, materials and vegetation that are to be used in the construction; density of plantings; descriptions of the stabilization and management techniques used to establish vegetation; and a description of who will be responsible for ongoing maintenance of vegetation for the stormwater management facility and what practices will be employed to ensure that adequate vegetative cover is preserved.

#### I. Operations and Maintenance Plan

Detailed description of ongoing operations and maintenance procedures for stormwater management facilities and practices to ensure their continued function as designed and constructed or preserved. These plans will identify the parts or components of a stormwater management facility or practice that need to be regularly or periodically

inspected and maintained, and the equipment and skills or training necessary. The plan shall include an inspection and maintenance schedule, maintenance tasks, responsible parties for maintenance, funding, and access and safety issues. Provisions for the periodic review and evaluation of the effectiveness of the maintenance program and the need for revisions or additional maintenance procedures shall be included in the plan.

**J. Maintenance Access Easements**

The applicant must ensure access from public right-of-way to stormwater management facilities and practices requiring regular maintenance at the site for the purpose of inspection and repair by securing all the maintenance access easements needed on a permanent basis. Such access shall be sufficient for all necessary equipment for maintenance activities. Upon final inspection and approval, a plat or document indicating that such easements exist shall be recorded and shall remain in effect even with the transfer of title of the property.

**K. Inspection and Maintenance Agreement and Covenant**

Unless an on-site stormwater management facility or practice is dedicated to and accepted by the (*local jurisdiction*) as provided in Section 3.4 below, the applicant must execute an easement and an inspection and maintenance agreement and covenant binding on all subsequent owners of land served by an on-site stormwater management facility or practice in accordance Section 3.4.

**L. Evidence of Acquisition of Applicable Local and Non-local Permits**

The applicant shall certify and provide documentation to the (*local jurisdiction*) that all other applicable environmental permits have been acquired for the site prior to approval of the stormwater management plan.

**3.4. Stormwater Management Inspection and Maintenance Agreement and Covenant**

(1) Prior to the issuance of any permit for a land development activity requiring a stormwater management facility or practice hereunder, the applicant (or owner of the site, if different) must execute an inspection and maintenance agreement and covenant that shall be binding on all subsequent owners of the site, unless the on-site stormwater management facility or practice is dedicated to and accepted by the (*local jurisdiction*).

(2) The inspection and maintenance agreement and covenant shall include the following information:

A. Identification by name or official title the person(s) responsible for carrying out the inspection and maintenance.

B. A statement that responsibility for the operation and maintenance of the stormwater management facility or practice, unless assumed by a governmental agency, shall remain with the property owner and shall pass to any successor owner.

C. A provision stating that if portions of the land are sold or otherwise transferred, legally binding arrangements shall be made to pass the inspection and maintenance responsibility to the appropriate successors in title. These arrangements shall

designate for each portion of the site, the person to be permanently responsible for its inspection and maintenance.

D. A maintenance schedule stating when and how often routine inspection and maintenance will occur to ensure proper function of the stormwater management facility or practice.

E. Plans for annual inspections to ensure proper performance of the facility between scheduled maintenance and remedies for the default thereof.

(3) The inspection and maintenance agreement and covenant shall be approved by the (*local jurisdiction*) prior to concept plan approval, and recorded with the deed upon final plat approval.

(4) In addition to enforcing the terms of the inspection and maintenance agreement and covenant, the (*local jurisdiction*) may also enforce all of the provisions for ongoing inspection and maintenance in Section 7 of this ordinance.

### **3.5. Performance Bonds**

The (*local jurisdiction*) shall require from the developer a surety or cash bond, irrevocable letter of credit, or other means of security acceptable to the (*local jurisdiction*) prior to the issuance of any building and/or grading permit for the construction of a development requiring a stormwater management system. The amount of the security shall not be less than the total estimated construction cost of the stormwater management system. The bond required in this section shall include provisions relative to forfeiture for failure to complete work specified in the approved stormwater management plan, compliance with all of the provisions of this ordinance, other applicable laws and regulations, and any time limitations. The bond shall not be fully released without a final inspection of the completed work by the (*local jurisdiction*), submission of "as-built" plans, a signed maintenance agreement, and a certification of completion by the (*local jurisdiction*) that the stormwater management system complies with the approved plan and provisions of this ordinance. A procedure may be used to release parts of the bond held by the (*local jurisdiction*) after various stages of construction have been completed and accepted by the (*local jurisdiction*). The procedures used for partially releasing performance bonds must be specified by the local authority in writing prior to the approval of a stormwater management plan.

### **3.6. Permit Application Procedure**

(1) Applications for land development permits shall be filed with the (*local jurisdiction*).

(2) Permit applications shall include the items set forth in Section 3.1 above (two copies of the stormwater management plan and the inspection maintenance agreement and covenant, if applicable, shall be included).

(3) The (*local jurisdiction*) shall inform the applicant whether the application, stormwater management plan and inspection and maintenance agreement and covenant are approved or disapproved.

(4) If the permit application, stormwater management plan or inspection and maintenance agreement and covenant are disapproved, the (*local jurisdiction*) shall notify the applicant of such fact in writing. The applicant may then revise any item not meeting the

requirements hereof and resubmit the same, in which event subparagraph 3 above and this subparagraph shall apply to such re-submittal.

- (5) Upon a finding by the (*local jurisdiction*) that the permit application, stormwater management plan and inspection and maintenance agreement and covenant, if applicable, meet the requirements of this ordinance, the (*local jurisdiction*) may issue a permit for the land development project, provided all other legal requirements for the issuance of such permit have been met.
- (6) Notwithstanding the issuance of the permit, in conducting the land development project, the applicant or other responsible person shall be subject to the following requirements:
  - a. The applicant shall comply with all applicable requirements of the approved plan and this ordinance and shall certify that all land clearing, construction, land development and drainage will be done according to the approved plan;
  - b. The land development project shall be conducted only within the area specified in the approved plan;
  - c. The (*local jurisdiction*) shall be allowed to conduct periodic inspections of the project;
  - d. No changes may be made to an approved plan without review and written approval by the (*local jurisdiction*); and,
  - e. Upon completion of the project, the applicant or other responsible person shall submit the engineer's report and certificate and as-built plans required by Section 6.2.

Under no circumstances shall an off-site or regional facility be permitted to serve a site in areas designated as Priority One Areas, Priority Two Areas or Development Node Areas as described in Section 5 herein, unless a variance has been issued pursuant to Section 5.5 herein.

### **3.7. Application Review Fees**

A non-refundable permit fee will be collected at the time the stormwater management plan is submitted. All of the monetary contributions shall be credited to a local budgetary category to support local plan review, administration and management of the permitting process, and inspection of all projects subject to this ordinance. The (*local jurisdiction*) shall develop a fee schedule based on the area of land disturbed by the project and may amend the fee schedule from time to time.

### **3.8. Modifications for Off-Site Facilities**

The stormwater management plan for each land development project shall provide for stormwater management measures located on the site of the project, unless provisions are made to manage stormwater by an off-site or regional facility. The off-site or regional facility must be located on property legally dedicated for the purpose, must be designed and adequately sized to provide a level of stormwater quantity and quality control that is equal to or greater than that which would be afforded by on-site practices and there must be a legally-obligated entity responsible for long-term operation and maintenance of the off-site or regional stormwater facility. In addition, on-site measures shall be implemented, where necessary, to protect upstream and downstream properties and drainage channels from the site to the off-site facility.

A stormwater management plan must be submitted to the (*local jurisdiction*) which shows the adequacy of the off-site or regional facility.

To be eligible for a modification, the applicant must demonstrate to the satisfaction of the (*local jurisdiction*) that the use of an off-site or regional facility will not result in the following impacts to upstream or downstream areas:

- (1) Increased threat of flood damage to public health, life, and property;
- (2) Deterioration of existing culverts, bridges, dams, and other structures;
- (3) Accelerated streambank or streambed erosion or siltation;
- (4) Degradation of in-stream biological functions or habitat; or
- (5) Water quality impairment in violation of State water quality standards, and/or violation of any state or federal regulations.

## **Section 4. Post-Development Stormwater Management Performance Criteria**

All site designs shall establish stormwater management practices to control the peak flow rates of stormwater discharge associated with specified design storms and reduce the volume of stormwater runoff generated. These practices should seek to use pervious areas for stormwater treatment and to infiltrate stormwater runoff from driveways, sidewalks, rooftops, parking lots, and landscaped areas to the maximum extent practical to provide treatment for both water quality and quantity.

The following performance criteria shall be applicable to all stormwater management plans, unless otherwise provided for in this ordinance:

### **4.1. Water Quality**

All stormwater runoff generated from a site shall be adequately treated before discharge. Stormwater practices must treat the first 1.2 inches of runoff from all storms and remove 80% of the post-development total suspended solid load from treated runoff. It will be presumed that a stormwater management system complies with this requirement if:

- (1) It is sized to treat the prescribed water quality treatment volume from the site, as defined in the Georgia Stormwater Management Manual; and,
- (2) Appropriate structural stormwater controls or nonstructural practices are selected, designed, constructed or preserved, and maintained according to the specific criteria in the Georgia Stormwater Management Manual or the Etowah Aquatic HCP Runoff Limits Manual; and,
- (3) Runoff from hotspot land uses and activities identified by the (*local jurisdiction*) are adequately treated and addressed through the use of appropriate structural stormwater controls, nonstructural practices and pollution prevention practices.

## **4.2. Stream Channel Protection**

Protection of stream channels from bank and bed erosion and degradation shall be provided by using all of the following three approaches:

- (1) Preservation, restoration and/or reforestation (with native vegetation) of any stream buffers protected through other regulations; and,
- (2) Erosion prevention measures such as energy dissipation and velocity control; and,
- (3) 24-hour extended detention storage of the 1-year, 24-hour return frequency storm event. This requirement may be reduced or waived through the use of other structural and nonstructural measures that allow for infiltration of runoff. The storage volume may be reduced by the volume that is infiltrated.

## **4.3. Overbank Flooding Protection**

Downstream overbank flood and property protection shall be provided by controlling (attenuating) the post-development peak discharge rate to the pre-development rate for the 25-year, 24-hour return frequency storm event. If control of the 1-year, 24-hour storm under Section 4.2 is exempted, then peak discharge rate attenuation of the 2-year through the 25-year return frequency storm event must be provided.

## **4.4. Extreme Flooding Protection**

Extreme flood and public safety protection shall be provided by controlling and safely conveying the 100-year, 24 hour return frequency storm event such that flooding is not exacerbated.

## **4.5. Structural Stormwater Controls**

All structural stormwater management facilities shall be selected and designed using the appropriate criteria from the Georgia Stormwater Management Manual or the Etowah Aquatic HCP Runoff Limits Manual. All structural stormwater controls must be designed appropriately to meet their intended function. For other structural stormwater controls not included in the Georgia Stormwater Management Manual or Etowah Aquatic HCP Runoff Limits Manual, or for which pollutant removal rates have not been provided, the effectiveness and pollutant removal of the structural control must be documented through prior studies, literature reviews, or other means and receive approval from the (*local jurisdiction*) before being included in the design of a stormwater management system. In addition, if hydrologic or topographic conditions, or land use activities warrant greater control than that provided by the minimum control requirements, the (*local jurisdiction*) may impose additional requirements deemed necessary to protect upstream and downstream properties and aquatic resources from damage due to increased volume, frequency, and rate of stormwater runoff or increased nonpoint source pollution loads created on the site in question.

Applicants shall consult the Georgia Stormwater Management Manual for guidance on the factors that determine site design feasibility when selecting and locating a structural stormwater control.

## **4.6. Stormwater Credits for Nonstructural Measures**

The use of Better Site Design and nonstructural stormwater management measures is encouraged to minimize reliance on structural stormwater management measures. The use of

one or more site design measures by the applicant may allow for a reduction in the water quality treatment volume required under Section 4.1 and the stream channel protection volume required under Section 4.2.3. The applicant may, if approved by the (*local jurisdiction*), take credit for the use of stormwater better site design practices and reduce the water quality and channel protection volume requirements. For each potential credit, there is a minimum set of criteria and requirements which identify the conditions or circumstances under which the credit may be applied. The site design practices that qualify for this credit and the criteria and procedures for applying and calculating the credits are included in the Georgia Stormwater Management Manual.

*Note: Section 5 of this ordinance sets out additional “Runoff Limits” performance standards for areas identified as Priority One Areas, Priority Two Areas and Development Node Areas. In these areas, meeting the Runoff Limits standards may necessitate the use of nonstructural and structural stormwater management measures that allow for infiltration or evapotranspiration. See the Etowah Aquatic HCP Runoff Limits Manual for guidance on meeting these performance standards. In many cases, design of the system to meet the Runoff Limits standard will also meet the standards described in 4.1, 4.2, 4.3 and 4.4 without the need for additional structures.*

#### **4.7. Drainage System Guidelines**

Stormwater conveyance facilities, which may include but are not limited to culverts, stormwater drainage pipes, catch basins, drop inlets, junction boxes, headwalls, gutter, swales, channels, ditches, and energy dissipaters shall be provided when necessary for the protection of public right-of-way and private properties adjoining project sites and/or public right-of-ways. Stormwater conveyance facilities that are designed to carry runoff from more than one parcel, existing or proposed, shall meet the following requirements:

- (1) Methods to calculate stormwater flows shall be in accordance with the Georgia Stormwater Management Manual;
- (2) All culverts, pipe systems and open channel flow systems shall be sized in accordance with the stormwater management plan using the methods included in the Georgia Stormwater Management Manual; and,
- (3) Design and construction of stormwater conveyance facilities shall be in accordance with the criteria and specifications found in the Georgia Stormwater Management Manual.

## **Section 5. Priority Areas**

### **5.1. Runoff Limits Imposed**

Land development projects located within areas designated “Priority Area 1,” “Priority Area 2” and “Development Node” on the [jurisdiction’s official Priority Areas and Development Node Map] shall adhere to the Runoff Limits performance criteria. The Runoff Limits determine the volume of water permitted to leave the site as stormwater runoff. They apply to all storm events up to and including the regional two-year, 24-hour storm, and are calculated using existing soil conditions on site. The Runoff Limits performance criteria are as follows:

1. In Priority One Areas, the Runoff Limit on a site is equal to the volume of surface runoff calculated to occur on the site if 100% of the site were covered in a forest in good cover.
2. In Priority Two Areas, the Runoff Limit on a site is equal to the volume of surface runoff calculated to occur on the site if 95% of the site were covered in a forest in good cover, and 5% of the site were covered in impervious surfaces.
3. In Development Node Areas, the Runoff Limit on a site is equal to the volume of surface runoff calculated to occur on the site if the area covered by impervious surfaces post development were 50% of the actual impervious area covering the site post development, and the remainder of the site were covered in forest in good cover.

• *Note: This means that the Runoff Limit for a development node varies depending on the amount of impervious area covering the site. For example, a site plan calls for 70% impervious cover. The Runoff Limit is the volume of runoff assuming that 35% of the site were covered in impervious surface, and 65% of the site were covered in mature forest.*

## **5.2. Runoff Limits Calculations**

The Runoff Limit and the post-development runoff level for a site shall be calculated according to the procedures found in the Etowah Aquatic HCP Runoff Limits Manual. If the post-development runoff level for a site exceeds the Runoff Limit, the site shall be redesigned to reduce the volume of runoff generated, and/or structural stormwater BMPs shall be employed to allow for infiltration and/or evapotranspiration of stormwater runoff from impervious surfaces and landscaped areas, so that the Runoff Limit is met.

## **5.3. Structural Stormwater BMPs for Runoff Limits**

All infiltration and evapotranspiration structural stormwater BMPs used to meet the Runoff Limits shall be selected and designed using the appropriate criteria from the Etowah Aquatic HCP Runoff Limits Manual. All such BMPs must be designed appropriately to meet their intended function. BMPs may be employed to meet both the Runoff Limits criteria and the other performance criteria of Section 4. For other structural stormwater BMPs not included in the Etowah Aquatic HCP Runoff Limits Manual, the effectiveness of the structural BMP must be documented through prior studies, literature reviews, or other means, according to the standards described in the Etowah Aquatic HCP Runoff Limits Manual, and receive approval from the (local jurisdiction) before being included in the design of a stormwater management system.

## **5.4. Procedures for Amending the Priority Areas Map**

In reviewing, recommending, and acting on applications for amendments to the (*jurisdiction's official Priority Areas and Development Node Map*), the (*local jurisdiction*) shall consider whether the proposal is consistent with (a) the Incidental Take Permit for the Etowah Aquatic HCP held by (*local jurisdiction*) and (b) the following Etowah Aquatic HCP basin-wide population thresholds for Etowah darters, Cherokee darters and amber darters, as calculated using the most current version of the Etowah Aquatic HCP Species Occurrence and Abundance Model.

(1) The Etowah darter population thresholds require that:

- a. At least 30% of stream miles in which probability of occurrence is greater than or equal to 80%, pursuant to the 2006 species occurrence map, shall maintain a predicted probability of occurrence greater than or equal to 80% (“30/80/80 rule”);
- b. At least 50% of stream miles in which the probability of occurrence is greater than or equal to 80%, pursuant to the 2006 species occurrence map, shall maintain a predicted probability of occurrence greater than or equal to 50% (“50/80/50 rule”).
- c. All stream miles in which the probability of occurrence is greater than or equal to 25%, pursuant to the 2006 species occurrence map, must maintain a probability of occurrence above 5% (“100/25/5 rule”).

Conditions (a) and (b) apply to five designated watershed areas that have high probability of occurrence under 2006 conditions:

- a. Headwaters of the Etowah River mainstem
- b. Upper Etowah River mainstem and lower reach of Shoal Creek (Dawson County)
- c. Amicalola Creek system
- d. Long Swamp Creek system
- e. Raccoon Creek

(2) The Amber darter population thresholds require that:

- a. At least 30% of stream miles in which probability of occurrence is greater than or equal to 80% under 2006 conditions must maintain a predicted probability of occurrence greater than or equal to 80% under the buildout scenario (“30/80/80 rule”).
- b. At least 50% of stream miles in which the 2006 probability of occurrence is greater than or equal to 80% must maintain a predicted probability of occurrence greater than or equal to 50% under the buildout scenario (“50/80/50 rule”).

The preceding requirements apply to each of four designated populations areas that have known occurrence of amber darters:

- a. Upper Etowah R. mainstem and lower Amicalola
- b. Middle Etowah R. mainstem and lower Long Swamp Creek
- c. Lower Etowah R, mainstem and lower Sharp Mt. Creek
- d. Lower Shoal Cr (Cherokee County).

(3) The Cherokee darter population thresholds require that:

- a. The total decline in Cherokee darter abundances under the buildout scenario, relative to 2006 conditions, must not exceed 30%.
- b. At least 90% of stream miles in which estimated mean abundance is greater than or equal to 70 under 2006 conditions must maintain an estimated abundance of at least 33 under the buildout scenario.

The preceding requirements apply to occupied ranges of each of the three recognized evolutionarily significant units (ESUs) of the Cherokee darter:

- a. Upper ESU: tributaries to the Etowah upstream of the confluence of Amicalola Creek and the Etowah River mainstem

- b. Middle ESU: tributaries of the Etowah upstream from the confluence of Stamp Creek and the Etowah River mainstem (in Lake Allatoona) and downstream from Amicalola Creek
  - c. Lower ESU: tributaries to Lake Allatoona and the Etowah mainstem downstream from and including Stamp Creek.
- (4) In Priority 1 Areas, map amendments shall be limited to changes from Priority 1 to development node, or from development node to Priority 1. In Priority 2 Areas, map amendments shall be limited to changes from Priority 2 to development node, or from development node to Priority 2; other types of map amendments shall not be considered.

### **5.5. Variance Procedures**

Variances from the above Runoff Limits performance criteria may be granted in accordance with the following provisions:

- (1) Where a parcel was platted prior to the effective date of this ordinance and any combination of the following physical conditions occur over 80% or more of the parcel so as to prevent land development that is consistent with the Runoff Limits performance criteria, then the [local jurisdiction commission/council] may grant a variance from the Runoff Limits hereunder:
- a. Bedrock within 2 feet of the surface
  - b. Soils with infiltration rates of less than 0.1 inches per hour
  - c. Seasonally high water table within two feet of the surface

Variances will not be considered when, following adoption of this ordinance, actions of any property owner of a given property have created conditions of hardship on that property. An approved variance shall allow a deviation from the relevant Runoff Limits performance criteria only to the extent necessary to provide relief from the conditions which prevented land development activities on the parcel. This subsection contains the only procedure available for granting a variance. No other variances, including administrative variances, may be granted to this ordinance.

- (2) At a minimum, a variance request shall include the following information:
- a. A site map that includes locations of all streams, wetlands, floodplain boundaries and other natural features, as determined by field survey;
  - b. A description of the shape, size, topography, slope, soils, vegetation, geology, and other physical characteristics of the property;
  - c. Documentation of the inability to develop the property without a variance;
  - d. A calculation of the extent of the deviation from the relevant Runoff Limits performance criteria needed to provide relief from the conditions which prevented land development activities on the parcel;
  - e. A copy of the stormwater management plan.
- (3) The following factors shall be considered in determining whether to issue a variance:
- a. Whether alternative designs are possible which require less deviation or no deviation from the Runoff Limits performance criteria;
  - b. The long-term and construction water quality impacts of the proposed variance.

## **Section 6. Construction Inspections of Post-Development Stormwater Management System**

### **6.1. Inspections to Ensure Plan Compliance During Construction**

Periodic inspections of the stormwater management system construction shall be conducted by the staff of the (*local jurisdiction*) or conducted and certified by a professional engineer who has been approved by the (*local jurisdiction*). Construction inspections shall utilize the approved stormwater management plan for establishing compliance.

All inspections shall be documented with written reports that contain the following information:

- (1) The date and location of the inspection;
- (2) Whether construction is in compliance with the approved stormwater management plan;
- (3) Variations from the approved construction specifications; and,
- (4) Any other variations or violations of the conditions of the approved stormwater management plan.

If any violations are found, the applicant shall be notified in writing of the nature of the violation and the required corrective actions.

### **6.2. Final Inspection and As Built Plans**

Upon completion of a project, and before a certificate of occupancy shall be granted, the applicant is responsible for certifying that the completed project is in accordance with the approved stormwater management plan. All applicants are required to submit actual "as built" plans for any stormwater management facilities or practices after final construction is completed. The plan must show the final design specifications for all stormwater management facilities and practices and must be certified by a Professional Engineer. A final inspection by the (*local jurisdiction*) is required before the release of any performance securities can occur.

## **Section 7. Ongoing Inspection and Maintenance of Stormwater Facilities and Practices**

### **7.1. Maintenance Responsibility**

The owner of the property upon which work has been done pursuant to this Ordinance for private stormwater management facilities, regional stormwater facilities, and stormwater BMPs, or any other person or agent in control of such property, shall maintain in good condition and promptly repair and restore all grade surfaces, walls, drains, dams and structures, vegetation, erosion and sedimentation controls, and other protective devices. Such repairs or restoration and maintenance shall be in accordance with the approved inspection and maintenance agreement and covenant.

If the owner of the stormwater management facility, regional stormwater facility, or stormwater BMP is an owner's association, unit owners' association, or homeowners' association, the

owner shall provide the (local jurisdiction) a copy of the association's recorded declaration. The declaration must provide:

- (1) That the facility or BMP is part of the common elements and shall be subject to the inspection and maintenance agreement and covenant;
- (2) That membership in the association shall be mandatory and automatic for all unit owners or homeowners of the development and their successors;
- (3) That the association shall have lien authority to ensure the collection of dues from all members;
- (4) That the requirements of the inspection and maintenance agreement and covenant shall receive the highest priority for expenditures by the association except for any other expenditures which are required by law to have a higher priority;
- (5) That a separate fund shall be maintained by the association for the routine maintenance, reconstruction and repair of the facilities and/or BMPs, separate from all other funds of the association; that it shall be kept in an account insured by the FDIC or by another entity acceptable to the (local jurisdiction);
- (6) That the routine maintenance, reconstruction, and repair fund shall contain at all times the dollar amount reasonably determined from time to time by (local jurisdiction) to be adequate to pay for the probable reconstruction and repair cost (but not routine maintenance cost) for a three-year period;
- (7) That, to the extent permitted by law, the association shall not enter into voluntary dissolution unless the facilities and/or BMPs are transferred to a successor owner.

The (local jurisdiction), in lieu of an inspection and maintenance agreement and covenant, may accept dedication of any existing or future stormwater management facility or BMP for maintenance, provided such facility or BMP meets all the requirements of this Ordinance, is in proper working order at the time of dedication, and includes adequate and perpetual access and sufficient area for inspection and regular maintenance. Such adequate and perpetual access shall be accomplished by granting of an easement to the (local jurisdiction) or through fee simple dedication to the (local jurisdiction).

Stormwater management facilities and practices included in a stormwater management plan which are subject to an inspection and maintenance agreement and covenant must undergo ongoing inspections to document maintenance and repair needs and ensure compliance with the requirements of the agreement and covenant, the stormwater management plan, and this Ordinance.

## **7.2. Maintenance Inspections**

The (local jurisdiction) shall ensure that preventative maintenance is performed by inspecting all stormwater management systems. Facilities and/or BMPs serving 20,001 sq. ft. of impervious cover or more shall be inspected at least annually. Facilities and/or BMPs serving more than 5,001 sq. ft. but less than or equal to 20,000 sq. ft. of impervious cover shall be inspected at least biennially. Facilities and/or BMPs serving 5,000 sq. ft. of impervious cover or less shall be inspected at least triennially.

Inspection reports shall be submitted to and maintained by the (local jurisdiction) for all stormwater management systems.

Inspection reports for stormwater management systems shall include:

- (1) The date of inspection
- (2) Name of inspector
- (3) The condition of
  - (a) Vegetation or filter media
  - (b) Fences or other safety devices
  - (c) Spillways, valves, or other control structures
  - (d) Embankments, slopes, and safety benches
  - (e) Reservoir or treatment areas
  - (f) Inlet and outlet channels and structures
  - (g) Underground drainage
  - (h) Sediment and debris accumulation in storage and forebay areas
  - (i) Any nonstructural practices
  - (j) Any other item that could affect the proper function of the stormwater management system
- (4) Description of the need for maintenance

In the event that the stormwater management facility has not been maintained and/or becomes a danger to public safety or public health, the (*local jurisdiction*) shall notify the person responsible for carrying out the maintenance plan by registered or certified mail to the person specified in the inspection and maintenance agreement and covenant. The notice shall specify the measures needed to comply with the maintenance agreement and covenant and the maintenance plan and shall specify that the responsible person has 30 days or other time frame mutually agreed to between the (*local jurisdiction*) and the responsible person, within which such measures shall be completed. The (*local jurisdiction*) shall then conduct a subsequent inspection to ensure completion of the repair measures. If such measures are not completed, then enforcement procedures found in subsection 6.5 herein shall be followed by the (*local jurisdiction*).

### **7.3. Right-of-Entry for Inspection**

The terms of the inspection and maintenance agreement and covenant shall provide for the (*local jurisdiction*) to enter the property at reasonable times and in a reasonable manner for the purpose of inspection. This includes the right to enter a property when it has a reasonable basis to believe that a violation of this ordinance is occurring or has occurred and to enter when necessary for abatement of a public nuisance or correction of a violation of this ordinance.

#### **7.4. Records of Maintenance Activities**

Parties responsible for the operation and maintenance of a stormwater management facility shall provide records of all maintenance and repairs to the (*local jurisdiction*).

#### **7.5. Failure to Maintain**

If a responsible person fails or refuses to meet the requirements of this Ordinance and/or the inspection and maintenance agreement and covenant, the (*local jurisdiction*), after thirty (30) days written notice (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24 hours notice shall be sufficient), may correct a violation of the design standards or maintenance requirements by performing the necessary work to place the facility or practice in proper working condition. The (*local jurisdiction*) may assess the owner(s) of the facility for the cost of repair work which shall be a lien on the property, and may be placed on the ad valorem tax bill for such property and collected in the ordinary manner for such taxes.

### **Section 8. Violations, Enforcement and Penalties**

Any action or inaction which violates the provisions of this ordinance or the requirements of an approved stormwater management plan or permit, may be subject to the enforcement actions outlined in this Section. Any such action or inaction which is continuous with respect to time is deemed to be a public nuisance and may be abated by injunctive or other equitable relief. The imposition of any of the penalties described below shall not prevent such equitable relief.

#### **8.1. Notice of Violation**

If the (*local jurisdiction*) determines that an applicant or other responsible person has failed to comply with the terms and conditions of a permit, an approved stormwater management plan or the provisions of this ordinance, it shall issue a written notice of violation to such applicant or other responsible person. Where a person is engaged in activity covered by this ordinance without having first secured a permit therefore, the notice of violation shall be served on the owner or the responsible person in charge of the activity being conducted on the site.

The notice of violation shall contain:

- (1) The name and address of the owner or the applicant or the responsible person;
- (2) The address or other description of the site upon which the violation is occurring;
- (3) A statement specifying the nature of the violation;
- (4) A description of the remedial measures necessary to bring the action or inaction into compliance with the permit, the stormwater management plan or this ordinance and the date for the completion of such remedial action;
- (5) A statement of the penalty or penalties that may be assessed against the person to whom the notice of violation is directed; and,
- (6) A statement that the determination of violation may be appealed to the (*local jurisdiction*) by filing a written notice of appeal within thirty (30) days after the notice of violation (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24 hours notice shall be sufficient).

## 8.2 Penalties

In the event the remedial measures described in the notice of violation have not been completed by the date set forth for such completion in the notice of violation, any one or more of the following actions or penalties may be taken or assessed against the person to whom the notice of violation was directed. Before taking any of the following actions or imposing any of the following penalties, the (*local jurisdiction*) shall first notify the applicant or other responsible person in writing of its intended action, and shall provide a reasonable opportunity, of not less than ten days (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24 hours notice shall be sufficient) to cure such violation. In the event the applicant or other responsible person fails to cure such violation after such notice and cure period, the (*local jurisdiction*) may take any one or more of the following actions or impose any one or more of the following penalties.

- (1) **Stop Work Order** - The (*local jurisdiction*) may issue a stop work order which shall be served on the applicant or other responsible person. The stop work order shall remain in effect until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violation or violations described therein, provided the stop work order may be withdrawn or modified to enable the applicant or other responsible person to take the necessary remedial measures to cure such violation or violations.
- (2) **Withhold Certificate of Occupancy** - The (*local jurisdiction*) may refuse to issue a certificate of occupancy for the building or other improvements constructed or being constructed on the site until the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein.
- (3) **Suspension, Revocation or Modification of Permit** - The (*local jurisdiction*) may suspend, revoke or modify the permit authorizing the land development project. A suspended, revoked or modified permit may be reinstated after the applicant or other responsible person has taken the remedial measures set forth in the notice of violation or has otherwise cured the violations described therein, provided such permit may be reinstated [upon such conditions as the (*local jurisdiction*) may deem necessary] to enable the applicant or other responsible person to take the necessary remedial measures to cure such violations.
- (4) **Civil Penalties** - In the event the applicant or other responsible person fails to take the remedial measures set forth in the notice of violation or otherwise fails to cure the violations described therein within ten days, or such greater period as the (*local jurisdiction*) shall deem appropriate (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24 hours notice shall be sufficient) after the (*local jurisdiction*) has taken one or more of the actions described above, the (*local jurisdiction*) may impose a penalty not to exceed \$1,000 (depending on the severity of the violation) for each day the violation remains unremedied after receipt of the notice of violation.
- (5) **Criminal Penalties** - For intentional and flagrant violations of this ordinance, the (*local jurisdiction*) may issue a citation to the applicant or other responsible person, requiring such person to appear in (*appropriate municipal, magistrate or recorder's*) court to answer charges for such violation. Upon conviction, such person shall be punished by a

fine not to exceed \$1,000 or imprisonment for 60 days or both. Each act of violation and each day upon which any violation shall occur shall constitute a separate offense.

**Appendix 2**  
**Better Site Design Code and Ordinance Worksheet**

Feature	Model Guideline	Counties										Cities				
		Lumpkin	Bartow	Cherokee	Forsyth	Fulton	Cobb	Paulding	Pickens	Dawson	Canton	Cartersville	Kennesaw	Marietta	Roswell	
<b>1. Street Width</b>																
a. What is the maximum pavement width (back of curb to back of curb) allowed for streets in low density residential developments ?	20 ft for no on-street paking, 24 with parking on one side; 26 for parking on both sides	20	20	18	24	22	15-24	24	24	20	20	22	24	24	29	
b. At higher densities are parking lanes allowed to also serve as traffic lanes (i.e., queuing streets)?	Yes	no										no	no			
<b>2. Street Length</b>																
a. Do street standards promote the most efficient street layouts that reduce overall street length?	Yes	No	no	no	no	yes	no	no	no	no	no	no	no	no		
<b>3. Narrow Right of Way</b>																
a. What is the minimum right-of-way (ROW) width for a residential street?	< 45 ft	60	60	60	50-80	40	50-100	50	20-24	24	50	60	50	50	50	
b. Does the code allow utilities to be placed under the paved section of the ROW?	Yes	yes	no	yes						yes		yes (generally in row)	yes	yes*	Yes	
<b>4. Cul-de-sacs</b>																
a. What is the minimum radius allowed for cul-de-sacs?	< 35 ft	30	35	20	50	29	40	40	40	20		43 paved; 60 ROW	38 paved; 50 ROW	80		
b. Can a landscaped island be created within the cul-de-sac?	Yes	yes		yes		yes	yes									
c. Are alternative turn arounds such as "hammerheads" allowed on short streets in low density residential developments?	Yes	no		no		no	yes	yes	yes				No			
<b>5. Vegetated open channels</b>																
a. Are curb and gutters required for most residential street sections?	No	yes	yes	yes	no	no	yes	no		yes	yes	Yes	yes	yes	Yes	

	Feature	Model Guideline	Counties										Cities				
			Lumpkin	Bartow	Cherokee	Forsyth	Fulton	Cobb	Paulding	Pickens	Dawson	Canton	Cartersville	Kennesaw	Marietta	Roswell	
	b. Are there established design criteria for swales that can provide stormwater quality treatment (i.e., dry swales, biofilters, or grass swales)?	Yes	yes	yes	yes		yes	yes	yes	yes	yes	yes*	no	no*	no	Yes	
<b>6. Parking ratios</b>																	
	a. What is the minimum parking ratio for a professional office building (per 1000 ft2 of gross floor area)?	3			3.5	4	3	3				4	3.3	3.5		3.3 (4 max)	
	b. What is the minimum required parking ratio for shopping centers (per 1,000 ft2 gross floor area)?	3-3.5			5	4.5	5	5				5	3	5	3.5-4	3.6 (4.4 max)	
	c. What is the minimum required parking ratio for single family homes (per home)?	2	2	2	2	2	2	2				2	2	2		2 (4 max)	
	d. Are the parking requirements set as maximum or median (rather than minimum) requirements?	Yes	no	no	no	no	no	no	no	no	no	no	no	no	no	Yes	
<b>7. Parking Codes</b>																	
	a. Is the use of shared parking arrangements allowed?	Yes			yes	no	yes	yes	yes	yes	no	no	yes	yes	yes	Yes	
	b. Are model shared parking agreements provided?	Yes			no	no	no	no	no	no	no	no	no	no	no	No	
	c. Are parking ratios reduced if shared parking arrangements are in place?	Yes										no	no	no (except churches)	only churches	Yes	
	d. If mass transit is provided nearby, is the parking ratio reduced?	Yes										no in regs; yes in policy	no	no	yes	Yes	
<b>8. Parking Lots</b>																	
	a. What is the minimum stall width for a standard parking space?	9 ft		8.5	8.5	9		9				9	9	8.5	9	9	
	b. What is the minimum stall length for a standard parking space?	18 ft		18	19	18						20	18	19	20	20	
	c. Are at least 30% of the spaces at larger commercial parking lots required to have smaller dimensions for compact cars?	Yes										no		no	no (25%)	No	

	Feature	Model Guideline	Counties									Cities				
			Lumpkin	Bartow	Cherokee	Forsyth	Fulton	Cobb	Paulding	Pickens	Dawson	Canton	Carters ville	Kennesaw	Marietta	Roswell
	d. Can pervious materials be used for spillover parking areas?	Yes			yes	yes	no	yes			no	no	no	no	no	Yes
<b>9. Structured Parking</b>																
	a. Are there any incentives to developers to provide parking within garages rather than surface parking lots?	Yes		no	no	no	no	yes	no	no	no	no	no	no	yes (density bonus)	No
<b>10. Parking lot runoff</b>																
	a. Is a minimum percentage of a parking lot required to be landscaped?	Yes	yes	no	no	yes	no	no	no	no	no	yes	no	yes	yes	Yes
	b. Is the use of bioretention islands and other stormwater practices within landscaped areas or setbacks allowed?	Yes	no	no	yes	yes	yes	no	no	no	no		yes	yes		
<b>11. Open space design</b>																
	a. Are open space or cluster development designs allowed in the community?	Yes	yes	yes	yes	yes		yes	yes	yes	yes	yes	yes	yes	yes	Yes
	b. Is land conservation or impervious cover reduction a major goal or objective of the open space design ordinance?	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	Yes
	c. Are the submittal or review requirements for open space design greater than those for conventional development?	No	yes	no	no	yes		no	no	no	no	yes	yes	no	yes	No
	d. Is open space or cluster design a by-right form of development?	Yes	yes	yes	no	no		no	no	no	no	no				Yes
	e. Are flexible site design criteria available for developers that utilize open space or cluster design options (e.g, setbacks, road widths, lot sizes)	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	Yes
<b>12. Setbacks and frontages</b>																
	a. Are irregular lot shapes (e.g., pie-shaped, flag lots) allowed in	Yes	yes	yes	no	yes	yes	yes	yes	yes	yes	no	no	no	no	yes

Feature	Model Guideline	Counties										Cities				
		Lumpkin	Bartow	Cherokee	Forsyth	Fulton	Cobb	Paulding	Pickens	Dawson	Canton	Carters ville	Kennesaw	Marietta	Roswell	
the community?																
b. What is the minimum requirement for front setbacks for a one half (½) acre residential lot?	20 ft	30	25	30	25	60	20	40	75	40	50	20	35-40	30	50	
c. What is the minimum requirement for rear setbacks for a one half (½) acre residential lot?	25 ft or less	20	25	30	25	50	25	40	15	40	35	20	35	30	40	
d. What is the minimum requirement for side setbacks for a one half (½) acre residential lot?	8 ft	20	10	10	10	25	10	15	15	40	10	10	10	10	30	
e. What is the minimum frontage distance for a one half (½) acre residential lot?	80 ft or less	30	50	90	80	100	90	90	100	60	100	35	50	100	120	
<b>13. Sidewalks</b>																
a. What is the minimum sidewalk width allowed in the community?	4 ft or less	none	4	4	none	none	none	none	none	4	4	4	4	4	4	
b. Are sidewalks always required on both sides of residential streets?	No	no	no	no	no	no	yes	no	no	no	no	no	no	no	No	
c. Are sidewalks generally sloped so they drain to the front yard rather than the street?	Yes	no	no	no	no	no	no	no	no	no	no	no	no	no		
d. Can alternate pedestrian networks be substituted for sidewalks (e.g., trails through common areas)?	Yes	yes	no	yes	no	no	no	no	no	no	no	no	no	no		
<b>14. Driveways</b>																
a. What is the minimum driveway width specified in the community?	<= 18 ft	none	none	none	none	none	none	none	none	10	20	12	12	24?		
b. Can pervious materials be used for single family home driveways (e.g., grass, gravel, porous pavers, etc)?	Yes	yes	yes	yes	no	no	no	no	no	no	yes	no	no	no		
c. Can a "two track" design be used at single family driveways?	Yes	no	no	no	no	no	no	no	no	no	no	no	no	no		
<b>15. Open space management</b>																

	Feature	Model Guideline	Counties									Cities				
			Lumpkin	Bartow	Cherokee	Forsyth	Fulton	Cobb	Paulding	Pickens	Dawson	Canton	Carters ville	Kennesaw	Marietta	Roswell
	a. Does the community have enforceable requirements to establish associations that can effectively manage open space?	Yes	no	no	yes	no	no	no	no	no	no	no	yes	yes		Yes
	b. Are open space areas required to be consolidated into larger units?	Yes	no	no	no	yes	no	no	no	no	no	no	no	no	no	No
	c. Does a minimum percentage of open space have to be managed in a natural condition?	Yes	yes	yes	no	no	no	no	no	no	no	no	no	no	no	No
	d. Are allowable and unallowable uses for open space in residential developments defined?	Yes	no	yes	yes	yes	no	yes	yes	no	no		yes	yes	no	No
	e. Can open space be managed by a third party using land trusts or conservation easements?	Yes	yes	yes				yes					yes	yes		Yes
<b>16. Rooftop runoff</b>																
	a. Can rooftop runoff be discharged to yard areas?	Yes											yes	yes	yes	
	b. Do current grading or drainage requirements allow for temporary ponding of stormwater on front yards or rooftops?	Yes												no		No
<b>17. Tree preservation</b>																
	a. If forests or specimen trees are present at residential development sites, does some of the stand have to be preserved?	Yes			No	No (encouraged)		No				yes	no	no	no	Yes
	b. Are the limits of disturbance shown on construction plans adequate for preventing clearing of natural vegetative cover during construction?	Yes			Yes	Yes		Yes				yes	yes	yes	yes	Yes
<b>18. Land conservation incentives</b>																
	a. Are there any incentives to developers or landowners to conserve non-regulated land (open space design, density bonuses, stormwater credits or lower property tax rates)?	Yes	no	no			no	yes	yes	yes	no	no	no	no	yes	Yes

	Feature	Model Guideline	Counties									Cities					
			Lumpkin	Bartow	Cherokee	Forsyth	Fulton	Cobb	Paulding	Pickens	Dawson	Canton	Carters ville	Kennesaw	Marietta	Roswell	
	b. Is flexibility to meet regulatory or conservation restrictions (density compensation, buffer averaging, transferable development rights, off-site mitigation) offered to developers?	Yes	no	no	yes				yes	yes	yes	no	no	no	no	no	Yes
<b>19. Stormwater outfalls</b>																	
	a. Is stormwater required to be treated for quality before it is discharged?	Yes	no	no	no	no	no	no	yes	no			no	no	no	no	Yes
	b. Are there effective design criteria for stormwater best management practices (BMPs)?	Yes	no	yes	yes	no	no	no	yes	yes	yes	yes	yes*	yes*	no	no*	Yes
	c. Can stormwater be directly discharged into a jurisdictional wetland without pretreatment?	No	yes	yes	yes	no	no	no			no		yes	yes	yes		No
	d. Does a floodplain management ordinance that restricts or prohibits development within the 100 year floodplain exist?	Yes	yes	yes	yes	yes	no	no	no	no	yes	no	no	no	no		No

\* not in code but provided by state law or manual

## **Appendix 3**

### **Site Design Checklist**

# Etowah Habitat Conservation Plan Site Design Checklist

Effective stormwater management starts before the development of structural stormwater systems on a site. Significant reductions in the impacts of runoff and improved water quality can be achieved through thoughtful site design. The checklist below is intended to help you incorporate stormwater management techniques into your site design to minimize runoff and mimic pre-development hydrologic conditions. Please indicate the practices that you are applying to your development, and note the extent to which each model development principle is being implemented.

## Stormwater Management and Site Design

Parking areas, roadways, and driveways are the greatest contributors of impervious surfaces. Impervious areas alter site hydrology and directly impact water quality. Examples of these areas include streets, parking lots, rooftops and other paved or compacted surfaces that do not allow water to infiltrate into the ground.

The following methods can be used to reduce the total runoff volume from impervious surfaces.

### 1.0 Residential Streets

Design residential streets for the minimum required pavement width necessary to safely accommodate vehicular traffic. (On curbed streets widths should be measured from back of curb to back of curb. On non-curbed streets, widths should be measured edge to edge of pavement).

#### 1.1 20 ft for roads without on-street parking

Percentage of roads in compliance with these specifications:

\_\_\_ **20%-50%**

\_\_\_ **51%-80%**

\_\_\_ **81%-100%**

#### 1.2 24 ft for road with parking on one side of street

Percentage of roads in compliance with these specifications:

\_\_\_ **20%-50%**

\_\_\_ **51%-80%**

\_\_\_ **81%-100%**

#### 1.3 26 ft for road with parking on both sides of street

Percentage of roads in compliance with these specifications:

\_\_\_ **20%-50%**

\_\_\_ **51%-80%**

\_\_\_ **81%-100%**

If road widths are not in compliance, provide justification:

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## 2.0 Systems for Stormwater Management

Develop alternatives to traditional stormwater management.

Traditional stormwater management is the practice of moving water off site as quickly as possible to a centralized facility, such as a pond or a local tributary. Model development principles strive to allow infiltration of water to occur as close as possible to the original area of rainfall. By engineering terrain, vegetation, and soil features to perform this function, costly conveyance systems can be avoided, and the landscape can retain more of its natural hydrological function.

The development plan should include use of best management practices for stormwater. (Construction and engineering details are included in the Georgia Stormwater Manual, Vol. 2: [www.georgiastormwater.com](http://www.georgiastormwater.com))

Best management practices for stormwater include but are not limited to the following: bioretention areas, vegetated swales, interconnected swales, porous pavements, infiltration trenches, directing rooftop runoff to vegetated swales. (Maximum centerline slope for vegetated swales is 4%).

Percentage of stormwater from a 2 year storm event which will be infiltrated on site: (Show calculations. Calculation work sheets are provided in the Georgia Stormwater Manual, Vol. 2)

\_\_\_ **20%-50%**  
\_\_\_ **51%-80%**  
\_\_\_ **81%-100%**

If alternatives to traditional stormwater management were not used, please include justification for not implementing:

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## 3.0 Use no curb, roll top curbs, mountable curbs to allow sheet flow of stormwater into swales or infiltration areas.

Percentage of total street length using no curb, roll top curbs, mountable curbs:

\_\_\_ **20%-50%**  
\_\_\_ **51%-80%**  
\_\_\_ **81%-100%**

(percentages indicated should be a cumulative calculation of all sides of all streets in plan).

If curb and gutter is used, provide justification:

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**4.0** In residential areas, avoid the use of cul-de-sacs as much as possible. If cul-de-sacs are included in plan, please provide justification for choosing cul-de-sacs over an interconnected network of streets. A network of interconnected streets generally results in an overall decrease in impervious surface on site (depending on topography):

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**4.1** If cul-de-sacs are used, central landscaped areas should be incorporated.

Percentage of cul-de-sacs which include central landscaped areas:

- 20%-50%**
- 51%-80%**
- 81%-100%**

**4.2** If cul-de-sacs are used, the radius should reflect the minimum required turning radius for emergency and maintenance equipment which is 35ft. On curbed cul-de-sacs this should be measured from back of curb to back of curb. On non-curb streets, this should be measured from width of pavement edge to center.

Percentage of cul-de-sacs with turning radii no greater than 35ft:

- 20%-50%**
- 51%-80%**
- 81%-100%**

**5.0** Build shared parking on site.

<b>Parking Ratio</b>	<b>Model Recommendation</b>	<b>Current Requirements</b>
Professional office building	< 3 spaces/1000ft <sup>2</sup>	3-4 spaces/1000ft <sup>2</sup>
Shopping Center	3-3.5 spaces/1000ft <sup>2</sup>	3.5-5 spaces/1000ft <sup>2</sup>

Developers will be permitted to “ghost in” additional spaces. If future demand requires, the owner can increase the size of the parking lot without undertaking an entire planning approval process. If ghosting in additional spaces is anticipated, stormwater management should be designed for the maximum possible impervious surface area.

Percentage of parking spaces designated for use by more than one business (% shared parking).

- 20%-50%**
- 51%-80%**
- 81%-100%**

**5.1** Percentage of total parking area designated for compact car use:

- 20%-50%**
- 51%-80%**
- 81%-100%**

**6.0** Build with reduced setbacks on one or more sides of residential homes.

Recommended setbacks:

<b>Setbacks &amp; Frontages</b>	<b>Recommended setbacks &amp; frontage</b>	<b>Current Requirements*</b>
Front setback	20 ft or less	20-75 feet
Side setback	8 ft or less	10-40 feet
Rear setback	25 ft or less	15-50 feet
Minimum frontage	80 ft or less	30-120 feet

\* These are minimum requirements for ½ acre residential lots.

Percentage of houses meeting the recommended setback and frontage specifications:

- 20%-50%**
- 51%-80%**
- 81%-100%**

**7.0** Utilize cluster development techniques to preserve site in a natural state. Percentage of site remaining undisturbed (not cleared or graded) by construction activities:

- 20%-50%**
- 51%-80%**
- 81%-100%**

Much of the material for this checklist is excerpted from the Prince George's County, Maryland 1999 *Low Impact Development Design Strategies: An Integrated Design Approach*. Largo, Maryland. (See References) All planned low impact development techniques should conform to the designs of those presented in this manual. Descriptions of the above and other site design techniques can be found in the low impact development references listed in aforementioned manual or in the Georgia Stormwater Manual.

- Allan, J. D. 2004. Landscapes and riverscapes: the influence of land use on stream ecosystems. *Annual Review of Ecology, Evolution and Systematics* 35: 257-284.
- Bannerman, R., D. Owens, R. Dodds, and N. Hornewer. 1993. Sources of pollutants in Wisconsin stormwater. *Water Science and Technology* 28: 241-259.
- Bascompte, J., H. Possingham, and J. Roughgarden. 2002. Patchy populations in stochastic environments: Critical number of patches for persistence. *American Naturalist* 159: 128-137.
- Booth, D. B., and C. R. Jackson. 1997. Urbanization of aquatic systems: Degradation thresholds, stormwater detection, and the limits of mitigation. *Journal of the American Water Resources Association* 33: 1077-1090.
- Ferguson, B. K. 1994. *Stormwater Infiltration*. Lewis Publishers, Boca Raton.
- Hanski, I. 1997. Metapopulation dynamics: from concepts and observations to predictive models in I. Hanski and M. E. Gilpin, eds. *Metapopulation Biology: Ecology, Genetics and Evolution*. Academic Press, San Diego.
- Hatt, B. E., T. D. Fletcher, C. J. Walsh, and C. M. Taylor. 2004. The influence of urban density and drainage infrastructure on the concentrations and loads of pollutants in small streams. *Environmental Management* 34: 112-124.
- Klein, R. D. 1979. Urbanization and stream quality impairment. *Water Resources Bulletin* 15: 948-963.
- Meador, M. R., J. F. Coles, and H. Zappia. 2005. Fish assemblage responses to urban intensity gradients in contrasting metropolitan areas: Birmingham, Alabama and Boston, Massachusetts. Pages 409-423 in L. R. Brown, R. M. Hughes, R. Gray, and M. R. Meador, eds. *Effects of Urbanization on Stream Ecosystems*. American Fisheries Society Symposium 47, Bethesda, Maryland.
- Metropolitan North Georgia Water Planning District. 2004. Model Stormwater Management Ordinances. Available online at <http://www.northgeorgiawater.com/>.
- Morgan, R. P., and S. F. Cushman. 2005. Urbanization effects on stream fish assemblages in Maryland, USA. *Journal of the North American Benthological Society* 24: 643-655.
- Morris, W. F., and D. F. Doak. 2002. *Quantitative Conservation Biology*. Sinauer Associates, Sunderland, MA.
- Paul, M. J., and J. L. Meyer. 2001. Streams in the urban landscape. *Annual Review of Ecology, Evolution and Systematics* 32: 333-365.
- Roy, A. H., M. C. Freeman, B. J. Freeman, S. J. Wenger, W. E. Ensign, and J. L. Meyer. 2005. Investigating hydrologic alteration as a mechanism of fish assemblage shifts in urbanizing streams. *Journal of the North American Benthological Society* 24: 656-678.
- Walsh, C. J., T. D. Fletcher, and A. R. Ladson. 2005a. Stream restoration in urban catchments through redesigning stormwater systems: looking to the catchment to save the stream. *Journal of the North American Benthological Society* 24: 690-705.
- Walsh, C. J., A. W. Leonard, A. R. Ladson, and T. D. Fletcher. 2004a. *Urban Stormwater and the Ecology of Streams*. Cooperative Research Center for Freshwater Ecology, Canberra, Australia.
- Walsh, C. J., P. J. Papas, D. Crowther, P. Sim, and J. Yoo. 2004b. Stormwater drainage pipes as a threat to a stream-dwelling amphipod of conservation significance, *Austrogammarus australis*, in South-eastern Australia. *Biodiversity and Conservation* 13: 781-793.
- Walsh, C. J., A. H. Roy, J. W. Feminella, P. D. Cottingham, and P. M. Groffman. 2005b. The urban stream syndrome: current knowledge and the search for a cure. *Journal of the North American Benthological Society* 24: 706-723.

- Walters, D. M., D. S. Leigh, and A. B. Bearden. 2003. Urbanization, sedimentation, and the homogenization of fish assemblages in the Etowah River Basin, USA. *Hydrobiologia* 494: 5-10.
- Wang, L. Z., J. Lyons, and P. Kanehl. 2001. Impacts of urbanization on stream habitat and fish across multiple spatial scales. *Environmental Management* 28: 255-266.