

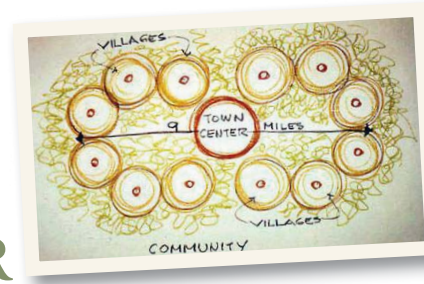


# Columbia Town Center Merriweather & Crescent Environmental Enhancements Study

Supplemental Document  
General Plan Amendment

**September 2008**

# COLUMBIA TOWN CENTER



## MERRIWEATHER & CRESCENT ENVIRONMENTAL ENHANCEMENTS STUDY

General Plan 2000  
Amendment



COLUMBIA TOWN CENTER

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General Plan 2000 Amendment

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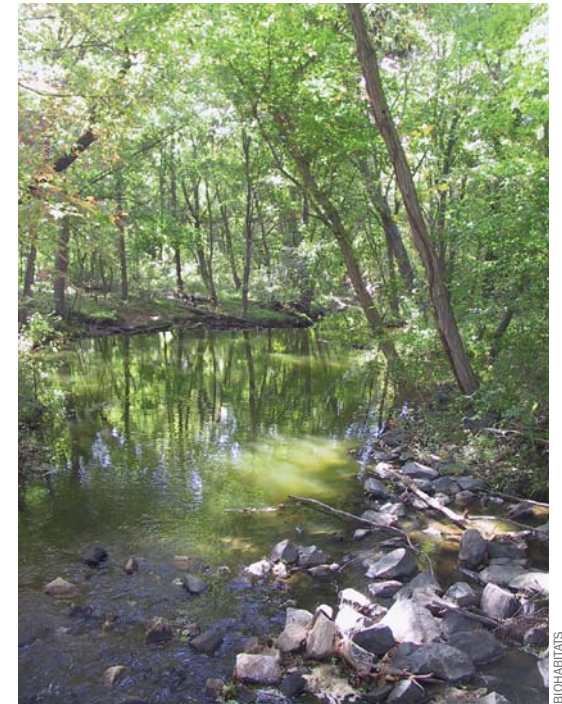
Prepared for  
General Growth Properties  
10275 Little Patuxent Parkway  
Columbia, MD 21044

September 2008

Renderings of Columbia Town Center produced by Sasaki & Associates

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BIOHABITATS

## EXECUTIVE SUMMARY

The Little Patuxent River and Symphony Stream corridors form the ecological backbone of Columbia and have long provided a strong connection to other natural areas within the Little Patuxent Watershed. In fact, the Little Patuxent River has been identified by Maryland's GreenPrint Program as an area of priority for conservation and restoration of green infrastructure to enhance statewide ecological connectivity.<sup>1</sup> As part of Maryland's "green infrastructure" the Little Patuxent River can provide a corridor to interconnect large contiguous blocks of protected natural land (hubs), and allow animal and plant dispersal and migration.

From this perspective James Rouse's 1960s vision of a community planned around protected stream valleys was truly innovative. Yet despite this vision and the best intentions of the community, the presence of invasive species, entrenched and degraded streams, and a lack of adequate forest regeneration and diversity reveal a certain degree of ecological degradation which is expected to continue without restorative action. By addressing this degradation, the redevelopment of Columbia Town Center can become a catalyst for revitalizing and restoring ecological health to Columbia.

Once thoroughly evaluated and truly understood, even degraded ecological systems have the potential to provide invaluable services such as habitat, flood control and water quality enhancement. Perhaps equally important, they have the power to reconnect people to the landscape and, by providing aesthetic and recreational amenities, greatly enhance the overall quality of life. In a Town Center striving to stay true to the vision of its founder, ecological enhancement is a necessity. As part of the revitalization and redevelopment of Town Center, General Growth Properties (GGP) will improve ecological connectivity by restoring and enhancing the current Little Patuxent River and Symphony Stream corridors. Stream and wetland restoration opportunities have been identified throughout Columbia's Town Center. Connectivity will be further enhanced through corridor management activities such as invasive species management, reforestation and understory plantings.

The forested areas of the Crescent and Merriweather areas in Columbia Town Center are a diverse and abundant collection of trees, dominated by tulip poplar, white oak, American beech, red oak, hickory and black gum. While more than 85% of these large trees are in good or fair health, the forest community faces a threatening invader: "noxious weeds." Non-native, invasive plants such as multiflora rose, Japanese honeysuckle and white mulberry may have the potential to convert a diverse and healthy forest into a vegetative community lacking diversity with little ecological value. By controlling invasive plant species throughout the forest, and by planting appropriate species in areas devoid of forest, GGP is taking critical action toward protecting and enhancing one of the Town Center's significant natural areas.

Little Patuxent River and Symphony Stream have long been treasured, natural features of Columbia but uncontrolled storm flows and the encroachment of development each have caused significant degradation. By conducting a thorough investigation of the streams of Columbia Town Center, GGP was able to identify approximately 4,880 linear feet of stream with the potential for restoration. By installing structures to guide the flow, raising the stream bed and stabilizing eroding banks, GGP can improve the structure, function and thus, long-term sustainability of Little Patuxent River, Symphony Stream and their tributaries.

Another opportunity to enhance the overall ecology of Columbia Town Center exists in the form of water saturated areas known as wetlands. Wetlands are among the most important ecosystems on earth. They provide critical wildlife habitat, prevent floods, clean polluted waters, protect shorelines and recharge groundwater aquifers. By removing invasive plants, planting native wetland species, and creating depressions in certain areas, GGP will enhance existing wetlands and create two additional acres.

<sup>1</sup> Maryland's GreenPrint Program identifies the most important unprotected natural lands in the state (hubs), connects these lands through a system of connectors (corridors), and save those lands through targeted acquisitions and easements.

At the end of the day, the ecological restoration and enhancement activities slated for Columbia Town Center (see Figure 1) will create or improve approximately 4,880 linear

feet of stream, 6.7 acres of non-tidal freshwater wetlands, and 90 acres of forest.



Figure 1. Environmental impacts & enhancements map for the Columbia Town Center Redevelopment.

# INTRODUCTION

This report describes the findings of a Natural Resource Assessment (NRA) performed on a 150 acre portion of the Columbia Town Center Redevelopment area. The general extent of the NRA includes 150 acres within the “Merriweather”, “Crescent” and the “Little Patuxent River Corridor” areas. The land area is bounded by the Little Patuxent Parkway to the north, MD Route 29 to the east, and Broken Land Parkway to the west/south (Figure 2).

Of the 150 acre NRA area, 106 acres are forested. Within approximately 70 acres of this forest (within the Merriweather and Crescent areas, see Figure 2), trees greater than 18” in diameter (DBH) were surveyed to evaluate potential impacts. Based on the footprint of the development areas proposed for the Columbia Town Center Redevelopment, Biohabitats quantified the overall impacts and potential improvements to forest resources that would benefit both the Town Center and the region.

Within the NRA, 5000 linear feet of Symphony stream and its tributaries were characterized, evaluated and ranked. Biohabitats quantified the overall impacts and potential improvements to these stream and wetland resources. Stream restoration activities will improve the structure and function of degraded streams on site through bank grading, installing in-stream structures, raising of the channel invert and stabilizing eroding banks.

Wetland enhancement and creation activities will improve the structure and function of existing wetland areas through invasive plant removal, planting of native wetland species, or grading to improve hydrology.

Integrated vegetation management will focus on the removal of invasive plant species while regenerating native plant species, resulting in more diverse, healthy forests and riparian systems. The specific activities necessary for restoration, enhancement and reforestation will be determined during the development of the integrated vegetation

management plan. The integrated vegetation management plan will be developed prior to implementation of management activities but will be considered a framework for the adaptive management of vegetation, with adjustments being made as conditions on the site change.

Restoration and enhancement activities within the NRA of the Columbia Town Center Redevelopment area will create or improve approximately 4880 linear feet of stream, 6.7 acres of non-tidal freshwater wetlands, and 90 acres of forest.

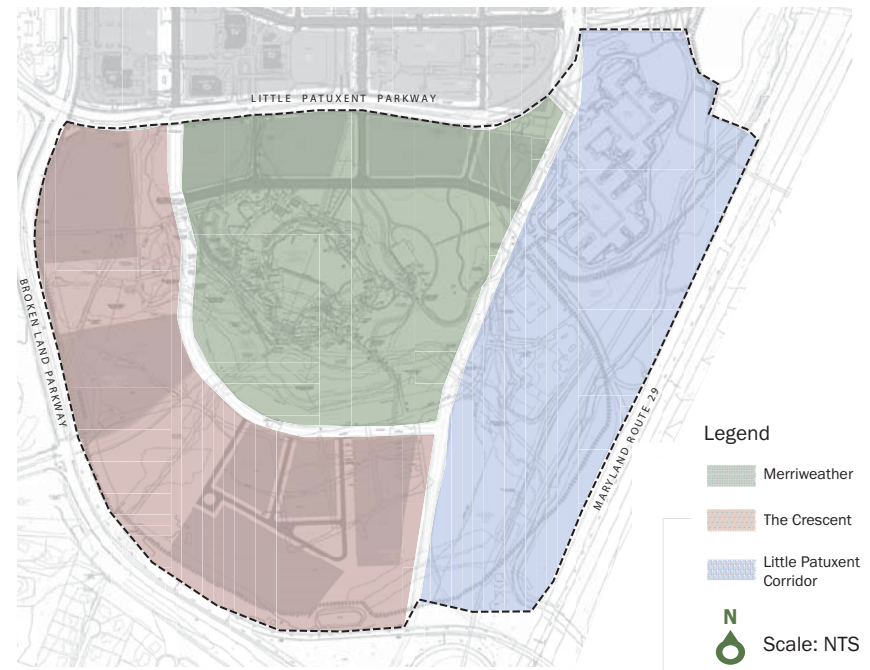


Figure 2. Location of the Natural Resource Assessment (NRA) areas for the Columbia Town Center Redevelopment.

# 1 NATURAL RESOURCE EXISTING CONDITIONS

## 1.1 Forests

Biohabitats assessed approximately 106 acres of forest community within the 150 acre NRA area. The extent of the assessment is shown in Figure 3. Each of the forest stands was characterized with regards to species composition and size/age. These stands were then evaluated for their condition or ability to provide ecological value.

### FOREST CHARACTERIZATION SAMPLING

Forested stands were initially delineated using color aerial photos. Further field investigation with AutoCADD/GIS drawings containing topography, streams, and soils allowed for more defined separation of the forested areas into specific forest communities. Using a combination of 1/10th & 1/100th acre fixed radius circular plots, the species and size composition was determined for tree, shrub and groundcover layers in each stand.

### CHARACTERIZATION

There were four primary forest community habitats observed in the 150 acre NRA area: Mixed Hardwood Park, Mixed Hardwood Riparian Wetland Forest, Mixed Hardwood Upland-Early Succession, and Mixed Hardwood Upland- Mature. Various modified versions of these basic four can be further distinguished based on changes in understory plants and severity of invasive plant presence which further subdivides the four categories in 22 specific subcategories (Appendix A: Forest Type Characterization).

### FOREST CONDITION SCORING

A set of parameters were developed for scoring the relative quality of the forest condition as it relates to the functional ability to provide ecosystem services. These parameters were given a range of values from 1 to 5 (5 being the highest value or most beneficial) for positive attributes (ie. Number of species, number of strata, and proximity to critical areas). Negative attributes (ie. Presence of invasives and disease) were assigned negative values ranging from -1 to -5 (-5 being worst condition). Using a data dictionary developed in Trimble Pathfinder software, data was collected for each stand using a Trimble GeoExplorer XM Global Positioning System (GPS) handheld datalogger. The cumulative scores of these parameters were calculated therefore ranking each stand with the highest score representing the best quality forest(Figure 3).

#### Forest Stand Quality Parameters:

- Number of Species: Cumulative number of native species in all layers.
- Seral Stage (age class): Successional stage of forested area.
- Vertical Structural Diversity: Number and extent of vegetative layers (ie.Canopy, understory, herbaceous/groundcover).
- Natural Regeneration Potential: Native seedlings present or not.
- Forest Interior: Forest interior within the stand.
- Non Native Invasive Species: Percent of NNIS present in each vegetative layer.
- Specimen Trees/Significant Trees: Trees >24" dbh present or not.
- Disease/Infestation: Significant disease or insect infestation present or not.
- Proximity to other forested areas/types (corridor potential)
- Proximity to other natural features of importance (wetlands, floodplains, hydric soils, erodible soils)





Figure 3. Map of assessed forest communities within the redevelopment area showing associated condition ranking. (White numbers refer to forest types in Appendix A.)

## INVASIVE VEGETATION

The NRA area has many areas of degraded forest habitat which are primary locations for forest restoration which have been targeted for redevelopment. The forest characterization highlights areas where the abundance and distribution of natural processes have been compromised by the influence of non-native invasive species. This creates an adverse ecological and economic effect impacting the regions natural resources.

Although the NRA area contains some healthy natural features, the ecosystem is negatively affected by the encroachment of non-native invasive species. Non-native invasive species have the ability to further degrade the forests of the NRA area and alter the regeneration of native vegetation. There is a risk of conversion to a monotypic vegetative community that contains little ecological value in the NRA areas currently dominated by non-native invasives. Specifically, there are a total of 16 non-native invasive plant species within the NRA area which includes: 3 tree species, 4 shrub species, 5 vine species, and 3 herbaceous species. The complete list of non-native invasive plant species observed in the NRA area can be found in Table 1.

TABLE 1. INVASIVE VEGETATION FOUND WITHIN THE NRA AREA

SCIENTIFIC NAME	COMMON NAME	STRATUM
<i>Lonicera japonica</i>	Japanese honeysuckle	Vine
<i>Rosa multiflora</i>	multiflora rose	Shrub
<i>Microstegium vimineum</i>	Japanese stiltgrass	Herbaceous
<i>Polygonum perfoliatum</i>	mile-a-minute	Vine
<i>Celastrus orbiculatus</i>	oriental bittersweet	Vine
<i>Lonicera sp.</i>	bush honeysuckle	Shrub
<i>Alliaria petiolata</i>	garlic mustard	Herbaceous
<i>Ailanthus altissima</i>	tree-of-heaven	Tree
<i>Hedera helix L</i>	English ivy	Vine
<i>Paulownia tomentosa</i>	empress tree	Tree
<i>Euonymus alata</i>	winged burning bush	Shrub
<i>Elaeagnus umbellata</i>	autumn olive	Shrub
<i>Polygonum cuspidatum</i>	Japanese knotweed	Herbaceous
<i>Albizia julibrissin</i>	silk tree/ mimosa tree	Tree
<i>Morus alba</i>	white mulberry	Tree
<i>Euonymus fortunei</i>	creeping euonymus	Vine

### CRESCENT & MERRIWEATHER TREE SURVEY

Biohabitats, Inc. conducted an individual tree survey within approximately 70 acres of the forest in the 150 acre NRA area. On 45 acres of these 70 acres within the Merriweather and Crescent areas (Figure 4), individual trees were surveyed. On the remaining 25 acres, the numbers of trees were estimated based on the tree densities observed in the surveyed area (~17 tree per acre). Trees greater than 18" in diameter (DBH) were counted to evaluate the impact of redevelopment on large trees.

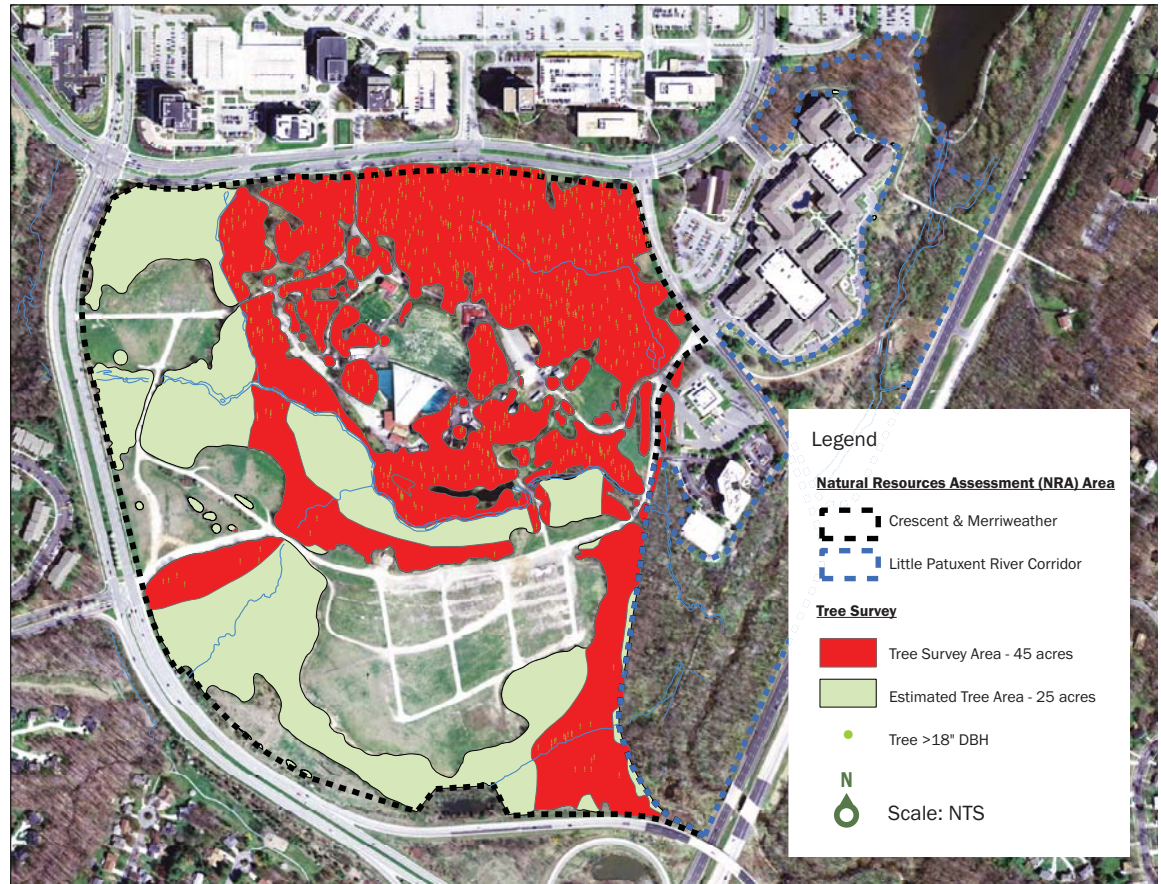


Figure 4. Tree survey area within the NRA area.

Biohabitats, Inc. characterized trees greater than 18" DBH. Each of the trees species, size (DBH), and general health were assessed and noted. Health assessments were based on a visual inspection of each tree looking for obvious signs of injury, decline and/or decay including: dead/dying branches, discolored leaves, fungus, open wounds or holes in the main trunk, or damaged roots (ISA, 2008). Each individual tree was then given a condition rating of either GOOD, FAIR, or POOR based on the extent and severity of any existing defects. Significant trees were also mapped using a Global Positioning System (GPS) to an accuracy of less than 1 meter.

Biohabitats, Inc. surveyed 789 trees in the Merriweather & Crescent areas consisting of approximately 24 different species (Table 2). Estimated areas add another 425 trees to the survey for a total of 1214 trees. The dominant species found in the survey area were tulip poplar (35.5%), white oak (19.8%), American beech (12.0%), red oak (10.6%) hickory (6.9%) and black gum (4.5%). Of these trees approximately half (46.9%) were between 18 and 23.9" DBH, approximately one-third (35.3%) were between 24 and 29.9" DBH, and the remaining 18.6% were greater than 30" DBH (Table 3).

TABLE 2. CRESCENT & MERRIWEATHER AREAS  
SIGNIFICANT TREE SIZE CLASSES BY SPECIES

SCIENTIFIC NAME	COMMON NAME	TREE SIZE			TOTAL
		18-23.9"	24-29.9"	30+"	
<i>Fagus americana</i>	American beech	2	0	0	2
<i>Populus grandidentata</i>	bigtooth aspen	40	29	26	95
<i>Prunus serotina</i>	black cherry	1	0	0	1
<i>Nyssa sylvatica</i>	black gum	25	10	0	35
<i>Juglans nigra</i>	black walnut	2	1	1	4
<i>Quercus macrocarpa</i>	bur oak	1	1	0	2
<i>Taxodium distichum</i>	bald cypress	0	3	2	5
<i>Ulmus sp.</i>	elm	1	0	0	1
<i>Fraxinus americana</i>	green ash	0	2	1	3
<i>Carya sp.</i>	hickory	43	8	3	54
<i>Ilex sp.</i>	holly	1	0	0	1
<i>Robinia pseudoacacia</i>	black locust	3	2	1	6
<i>Acer sp.</i>	maple	4	0	0	4
<i>Morus sp.</i>	mulberry	1	0	0	1
<i>Quercus palustris</i>	pin oak	5	5	2	12
<i>Acer rubrum</i>	red maple	22	5	4	31
<i>Quercus rubra</i>	red oak	26	36	23	85
<i>Acer saccharinum</i>	silver maple	1	0	2	3
<i>Platanus occidentalis</i>	sycamore	1	0	0	1
<i>Liriodendron tulipifera</i>	tulip poplar	106	113	62	281
unkown	unknown	3	0	0	3
<i>Quercus alba</i>	white oak	77	60	18	155
<i>Pinus strobus</i>	white pine	1	0	1	2
<i>Quercus phellos</i>	willow oak	0	1	1	2
Total		366	276	147	789
Percent of Total		47%	35%	18%	100%

The health assessment revealed that approximately two-thirds (63.4%) of the 789 trees were considered to be in GOOD condition. Another quarter (22.8%) were found to be FAIR with the remaining trees (13.8%) being either POOR or DEAD (Table 3).

TABLE 3. CRESCENT & MERRIWEATHER AREAS  
SIGNIFICANT TREE HEALTH STATUS BY SPECIES

SCIENTIFIC NAME	COMMON NAME	TREE HEALTH				TOTAL
		GOOD	FAIR	POOR	DEAD	
<i>Fagus americana</i>	American beech	0	1	1	0	2
<i>Populus grandidentata</i>	bigtooth aspen	71	18	6	0	95
<i>Prunus serotina</i>	black cherry	1	0	0	0	1
<i>Nyssa sylvatica</i>	black gum	26	8	1	0	35
<i>Juglans nigra</i>	black walnut	2	1	1	0	4
<i>Quercus macrocarpa</i>	bur oak	2	0	0	0	2
<i>Taxodium distichum</i>	bald cypress	1	0	0	0	1
<i>Ulmus sp.</i>	elm	1	0	0	0	1
<i>Fraxinus americana</i>	green ash	0	2	1	0	3
<i>Carya sp.</i>	hickory	28	16	8	2	54
<i>Ilex sp.</i>	holly	1	0	0	0	1
<i>Robinia pseudoacacia</i>	black locust	0	0	4	2	6
<i>Acer sp.</i>	maple	2	1	0	1	4
<i>Morus sp.</i>	mulberry	0	0	1	0	1
<i>Quercus palustris</i>	pin oak	3	4	5	0	12
<i>Acer rubrum</i>	red maple	16	8	6	1	31
<i>Quercus rubra</i>	red oak	37	22	19	7	85
<i>Acer saccharinum</i>	silver maple	3	0	0	0	3
<i>Platanus occidentalis</i>	sycamore	1	0	0	0	1
<i>Liriodendron tulipifera</i>	tulip poplar	198	56	25	2	281
<i>unkown</i>	unknown	0	1	0	2	3
<i>Quercus alba</i>	white oak	100	41	13	1	155
<i>Pinus strobus</i>	white pine	1	1	0	0	2
<i>Quercus phellos</i>	willow oak	2	0	0	0	2
Total		500	180	91	18	789
Percent of Total		63%	23%	12%	2%	100%

## 1.2 Streams

### HABITAT CONDITION

A visual-based stream habitat assessment was performed on over 5000 linear feet of perennial stream in the Merriweather & Crescent areas of the NRA area (Figure 5). Assessments were conducted using the Habitat Assessment Field Data Sheets for low gradient streams from the “Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers” produced by the U.S. Environmental Protection Agency (Barbour et. al, 1999). All perennial streams within the site were divided into survey reaches with breaks at road crossings and tributary confluences. Each entire survey reach was then evaluated for ten parameters and given a numerical rating from 1-10 based on criteria provided in the data sheets.

Ten Parameters:

- |                                    |                                    |
|------------------------------------|------------------------------------|
| 1) Available In-stream Cover       | 6) Channel Alteration              |
| 2) Pool Substrate Characterization | 7) Channel Sinuosity               |
| 3) Pool Variability                | 8) Bank Stability                  |
| 4) Sediment Deposition             | 9) Vegetative Protection           |
| 5) Channel Flow Status             | 10) Riparian Vegetative Zone Width |

Reference conditions were used to scale the assessment to the “best attainable” situation. An average score of 157 was achieved after surveying three selected reference reaches and this was determined to be the “best attainable” score. A ratio between the score for the reference reach and the survey reaches was calculated and each survey reach was classified (Optimal, Sub-Optimal, Marginal, Poor) relative to the reference conditions (Table 4).

TABLE 4. STREAM REACH RANKING WITHIN THE REDEVELOPMENT AREA

REACH	SCORE	REFERENCE	RATIO	CONDITION
1	101	157	0.643	Marginal
2	143	157	0.911	Optimal <sup>1</sup>
3	119	157	0.758	Sub-Optimal
4	120	157	0.764	Sub-Optimal
5	114	157	0.726	Sub-Optimal
6	121	157	0.771	Sub-Optimal
7	110	157	0.701	Sub-Optimal
8	90	157	0.573	Poor
9	93	157	0.592	Poor
10	104	157	0.662	Marginal

<sup>1</sup>Survey Reach 2 was observed to be significantly different than the other reaches with respect to channel substrate in that it contains bedrock and is therefore inherently more stable than the other reaches.

## 1.3 Wetlands & Floodplains

### HABITAT CONDITION

Wetland and 100-year floodplain boundaries were obtained as AutoCAD files as part of the available project engineering data. These boundaries were field verified by direct observation of topography and vegetation but no formal jurisdictional wetland delineation was performed. There are approximately 40 acres of floodplain and 5 acres of existing wetland within the NRA.



Figure 5. Map of assessed stream reaches within the Merriweather & Crescent area showing stream Habitat Condition rating.

## SECTION 2.0 ENVIRONMENTAL IMPACT ASSESSMENTS

Biohabitats assessed the estimated impacts of Columbia Town Center Redevelopment activities to existing natural resources within the NRA area. The goal of these assessments was to identify and quantify the amount of potential impact to streams, wetlands, forest, and individual trees. Impact areas were identified by overlaying the conceptual development design on top of an existing natural resource map. Any areas of existing forest, wetland and stream that were within potential areas of building and/or grading were considered to be impacted (Figure 1 Environmental Impacts & Enhancements Map).

### 2.1 Forests

Approximately 41 acres of the 106 acres of existing forest within the 150 acre NRA area were quantified as being impacted by the extent of the proposed road alignment and grading for the Columbia Town Center Redevelopment. Of the 1214 trees within the 70 acre Merriweather and Crescent areas, 588 are estimated to be impacted by the proposed road grading and building layout. Because the distribution of size classes and health classes was very even across the site, the characteristics of the existing trees that will be impacted mirror the percentages of Tables 2 & 3. Therefore, an estimated 49% of impacted trees will be between 18" and 23.0" DBH, 36% of impacted trees will be between 24" and 29.9" DBH, and 15% of impacted trees will be greater than 30"DBH. Similarly, 2% of impacted trees are DEAD, 11% of impacted trees will be in POOR condition, 22% of impacted trees will be in FAIR condition, and 65% of impacted trees will be in GOOD condition.

### 2.2 Streams

Approximately 945 linear feet of perennial stream were quantified as being potentially impacted by using the extent of anticipated road alignment and grading developed for the Columbia Town Center Redevelopment. Impacts to streams primarily occur at points of road crossings. (Additional impacts to streams from increased imperviousness due to development can be found in "Symphony Stream and Lake Kittamaquondi Watershed Assessments for Stormwater Master Planning Associated with Columbia Town Center").

### 2.3 Wetlands & Floodplains

Approximately 0.1 acres of wetland and 2.74 acres of floodplain were quantified as being potentially impacted by using the extent of building parcel, road alignment and grading estimated for the Columbia Town Center Redevelopment within the NRA area.



## SECTION 3.0 ENVIRONMENTAL ENHANCEMENT RECOMMENDATIONS

Based on impact areas of proposed Columbia Town Center Redevelopment plans and existing conditions within the NRA area, Biohabitats identified areas for potential stream, wetland, and forest restoration & reforestation (Figure 7 Environmental Impacts & Enhancements Map).

### 3.1 Forests

During the forest assessments, invasive plant species were noted throughout the NRA area. As such, contiguous parcels were identified where integrated vegetation management plans should be developed and implemented. These plans will be developed coincident with implementation of the work.

Integrated vegetation management focuses on the removal of invasive plant species while regenerating native plant species, resulting in more diverse and healthy riparian systems. The specific activities necessary to restore and regenerate an area will be determined during the development of the integrated vegetation management plan. These may include:

- Forest Restoration and enhancement – removal of invasive vegetation, establishment of native tree species, and establishment of missing vegetative strata (e.g., herb and shrub layers). Approximately 56 acres of forest restoration opportunities were identified.
- Reforestation and afforestation – re-establishment of appropriate forest communities through planting of areas that have been cleared or will be cleared of native forest. Approximately 34 acres were identified as potential areas for reforestation.

### 3.2 Streams

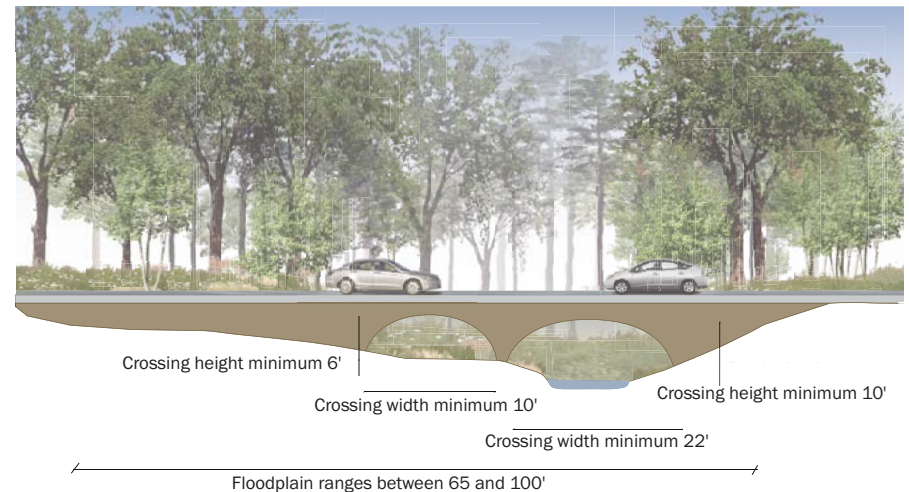
Stream restoration includes activities that will improve the structure and function of degraded streams on site including, bank grading, installing in-stream structures,

raising of the channel invert and stabilizing eroding banks. Approximately 4880 linear feet of stream within the NRA area were identified for stream restoration.

Symphony Stream and its associated riparian forest provide an important ecological function of corridor for the movement of wildlife across the landscape. Road crossings through this corridor will have reduced impact through the use of bottomless arch culverts facilitating the movement of wildlife (Figure 6).

### 3.3 Wetlands & Floodplains

Wetland enhancement activities will improve the structure and function of existing wetland areas through invasive plant removal, planting of native wetland species, or grading to improve hydrology. Approximately 2 acres of the NRA area were identified for wetland creation with an additional 5 acres for wetland enhancement (Figure 7).



Notes:  
Adequate fencing must be provided, standard height is 8' pagewire fencing, can be designed into the street edge vegetation.

Figure 6. Wildlife corridor arch culvert typical cross section



**Legend**

-  Existing Tree
-  Existing Surveyed Trees
-  Existing Forest Tree Line
-  Existing Forest To be Impacted (488 surveyed trees +100 estimated)
-  Reforestation - 34.5 ac
-  Forest Restoration - 56 ac (includes invasive species management)
-  Proposed Urban Landscapes (based on Cooper Robertson)
-  Existing Wetlands - 5.0 ac
-  Proposed Wetland Enhancement
-  Existing River or Stream
-  Stream Restoration Area
-  Stream Impacts - 945 ft
-  Property Line
-  Floodplain Delineation
-  Floodplain Impacted - 2 ac
-  Limits of Re-development
-  Natural Resource Assessment Area
-  Wildlife Crossing



Scale: NTS

# SECTION 4.0 ENVIRONMENTAL ENHANCEMENT BENEFITS

Based on the enhancement areas proposed for the Columbia Town Center Redevelopment plan and existing conditions within the NRA area, Biohabitats quantified overall improvements to stream, wetland, and forest resources that would benefit both the Town Center and the region.

## 4.1 Forests

Based on reforestation requirements provided in the Howard County Forest Conservation Manual, planting of native tree species will more than offset the State and County requirements by focusing on the removal of invasive plant species while regenerating native plant species, resulting in more diverse and healthy forest systems.

- Forest Restoration and Enhancement – The State of Maryland Forest Conservation Manual requires that forest conservation areas be enhanced through the control of “noxious weeds”. There are approximately 56 acres of forest restoration opportunity areas within the NRA area where such activities will occur as part of the Environmental Enhancements.
- Reforestation and Afforestation – The Howard County Forest Conservation Worksheet calculated that approximately 3.5 acres of reforestation would be required under restricted development scenarios. Approximately 34 acres of the NRA area are planned as areas for reforestation equating to a ten-fold increase beyond required reforestation.

## 4.2 Streams

Following stream mitigation guidelines for Maryland, stream restoration activities within the NRA area, such as installing in-stream structures and stabilizing eroding banks, will more than offset the 945 linear foot impact by approximately 3935 linear feet.

## 4.3 Wetlands & Floodplains

Following wetland mitigation guidelines for Maryland, wetland restoration & enhancement activities occur at a 2:1 ratio, 0.2 acres of forest wetland mitigation would be required. Within the NRA, areas of additional wetland creation through hydrologic improvements and planting native wetland species will more than offset the 0.3 acre requirement by the creation of 2 acres and enhancement of approximately 5 acres of wetland.

**TABLE 5. SUMMARY OF PROPOSED IMPACTS & ENHANCEMENTS**

(all numbers approximate)

	EXISTING	IMPACT	RESTORATION		TOTAL
			CREATION	ENHANCEMENT	
Forest (Acres)	106	41	34	56	90
Wetland (Acres)	5	0.1	2	5	7
Stream (Linear Feet)	5000	945	0	4880	4880
Floodplain (Acres)	40	2.74	2	47	49
Trees (Individuals)	1214	588	13600 <sup>1</sup>	5600 <sup>2</sup>	19200

<sup>1</sup>Based on reforestation using 400 trees per acre. <sup>2</sup>Based on supplementation of existing forest using 100 trees per acre.

# APPENDIX A: FOREST TYPE CHARACTERIZATION (see figure 3)

## HABITAT 1: CANOPY AND MAINTAINED UNDERSTORY

This portion of the study area has a park-like structure consisting of older, large diameter overstory trees and minimal understory or native groundcover. The canopy is mainly composed of tulip poplar- beech- hickory in the 18"-24" (DBH) range with a few smaller diameter 16" black gum. Much of the area's understory is maintained as grass with pockets of unmaintained areas of clover, smartweed, mint and hosta in wetter areas. Restoration opportunities in this area include developing an aged tree replacement strategy if intense maintenance of the understory is continued.

## HABITAT 2: REGENERATING MIXED HARDWOOD FOREST

This community is adjacent to the park-like forest area of Habitat 1 and appears to have once been treated similarly containing large 30" beech and white oak. Left unmaintained, the understory now has very young tree growth forming a dense layer of <1" hickory, red & white oak, black cherry, flowering dogwood, tulip poplar, beech and arrowwood. Herbaceous layer components include goldenrod, various grasses, Virginia creeper, grape, raspberry, and poison ivy. Non-native invasive multiflora rose and Japanese honeysuckle are a minor component of this regrowth.

## HABITAT 3: RIPARIAN HARDWOOD FOREST

The forests that line both sides of the stream flowing through Merriweather Post Pavillion occur as a mixture of large remnant native riparian trees such as sycamore and tulip poplar with an assemblage of overgrown landscape specimens such as yew and bald cypress. The more disturbed areas and forest canopy gaps at the upstream ends are composed of 1"-2" black gum and red maple with mile-a-minute, poison ivy, dogbane, nettles, Pennsylvania smartweed, raspberry, and multiflora rose.

## HABITAT 4: MATURE OAK-HICKORY FOREST

This is a mainly red oak- hickory dominated forest with an occasional tulip poplar and black gum in the overstory. Most overstory trees are 18"-24" with remnant 48" specimen trees occurring occasionally. A subcanopy layer exists in this forest stand consisting of locust, black gum, tulip poplar, and hickory with an 8"-12". The understory shrub layer is a dense association of flowering dogwood, sassafras, and ironwood with young beech, green ash and tulip poplar with a 1"-3". Tree regeneration and shrub components observed in the herbaceous layer (<1") included black cherry, hickory, locust, tulip poplar, maple, ironwood, arrowwood. Herbaceous species observed include: mayapple, Virginia creeper, wood aster, false solomon's seal, poison ivy, greenbriar, grape, and various ferns. This area also has a non-native invasive plant component primarily at the forest edge comprised of garlic mustard, Japanese honeysuckle, and multiflora rose. The southern edges of this area also contain the invasive tree-of-heaven, and empress tree.

## HABITAT 5: FORESTED RIPARIAN WETLAND

This forested wetland has an overstory of pin oak, red maple and black willow (12-18") with an understory mix of many native and non-native invasives. Vines are abundant and include poison ivy, grape, greenbriar and Virginia creeper for natives and mile-a-minute and Japanese honeysuckle for non-natives. Shrubs include arrowwood, spicebush, and raspberry with multiflora rose being very abundant. Among the non-native garlic mustard several native herbaceous plants exist including pokeweed, Pennsylvania smartweed, bluestem, asters, jewelweed, foxtail, and solidago. Green ash seedling also appear in the understory. Signs of beaver activity indicate previous inundation for this forest and great blue heron were also observed at this site. Excellent restoration opportunities exist at this site for wetland habitat enhancement through invasives control and shrub plantings. Incorporation of this area into a stormwater management facility may be a viable opportunity as well.

#### **HABITAT 6: EARLY SUCCESSION HARDWOOD FOREST ECOTONE**

This area is an early successional hardwood forest occurring as transition between older forest and open field areas comprised mostly of red maple and hickory ranging from 8"-12" with a sub-canopy component of 2"-3" red maple and hickory. Other less dominant species occurring in this community include tulip poplar (14") and aging locust (11"). Shrub layer vegetation includes spicebush and flowering dogwood. Herbaceous cover in this community includes mostly raspberry and Virginia knotweed with invasive Japanese stiltgrass and multiflora rose.

#### **HABITAT 7: OAK-TULIP POPLAR FOREST**

This area is an isolated patch of older forest bordered by road to the upland and wetland downslope. The overstory contains 18"-24" tulip poplar, >24" white oak and 34" pin oak. The next largest size class is a sub-canopy of 12"-16" red maple-black gum-pin oak. Numerous other hardwoods also occur at this site in the 1"-6" range including beech, hickory, flowering dogwood, red maple, black cherry, sassafras, and black gum. The sparse understory contains hickory seedling regeneration, greenbriar, spicebush, and arrowwood with ferns on the north facing slopes. Japanese honeysuckle occurs in the interior with multiflora rose near the forest edges.

#### **HABITAT 8: FORESTED RIPARIAN WETLAND**

The oak-tulip poplar forest of Habitat 7 transitions downslope into a riparian wetland, which contains some of the same components such as white oak and red maple but with the addition of 6"-8" black willow. This is predominantly a forested wetland with some gaps allowing for greater understory herbaceous vegetation including turtlehead, sedges, rushes and jewelweed. The shrub component in this area is somewhat lacking and Japanese stiltgrass blankets the forest floor. This area has great opportunity for wetland restoration through invasives management and understory shrub plantings. White-tailed deer signs were observed in this forest.

#### **HABITAT 9: EARLY SUCCESSION HARDWOOD FOREST ECOTONE**

A narrow strip of wooded area between Broken Land Parkway and the open field parking of Merriweather Post Pavillion is dominated by very young forest tree and shrub species. Although 18" tulip poplar and 6"-12" black cherry occur sporadically in this community,

much of this dense forest is red maple ranging from 2"-20". The understory is typical of edge communities containing raspberry, greenbriar and grape with invasives that include bush honeysuckle, multiflora rose, Japanese honeysuckle, and garlic mustard. The narrow dimensions of this forest and its proximity to both roadways and powerline transmission right-of-ways makes this forest particularly susceptible to invasion from non-natives and potentially difficult to restore.

#### **HABITAT 10: RIPARIAN FOREST**

The forest in this area contain a mixture of tree ages with large old oak, hickory, red maple, and tulip poplar (24-36") occurring along an old fence line that follows a stream through the middle of the forest tract. The remaining area is a relatively young forest with a composition similar to the early successional mixed hardwood forest of Habitat 6 with fewer edge community species. Red maple and hickory ranging from 8"-12" with a sub-canopy component of 2"-3" red maple and hickory. Other less dominant species occurring in this community include tulip poplar (14") and aging locust (11"). Shrub layer vegetation includes spicebush and flowering dogwood. Herbaceous cover in this community includes mostly raspberry and Virginia knotweed with invasive multiflora rose. Along with invasives management this area has an opportunity for stream restoration and/or stormwater management.

#### **HABITAT 15: FLOODPLAIN FOREST**

This large tract of forest contains many large overstory trees including white and pin oak (36-48"), tulip poplar and sycamore (24-36"), black cherry (18-24"), red maple, silver maple and black walnut (12-18"), box elder, locust and osage orange (2-12"). This seasonally inundated forest also has an invasive component of multiflora rose and shrub honeysuckle that appears to dominate the shrub layer.

#### **HABITAT 16: REGENERATING MIXED HARDWOOD FOREST**

This isolated patch of forest was left undeveloped presumably due to the steep sloped side of the ravine that it encompasses. This has allowed an overstory of white and pin oak (24-36"), black cherry (18-24"), and red maple (24") to remain. Its large amount of edge has created light conditions favorable for the growth of a dense understory and shrub layer as well. Sub-canopy species include black cherry, locust, tulip poplar,

and black gum (6-12") with box elder, ironwood, beech, hickory, red maple, dogwood, and mulberry (2-6"). Although arrowwood and spicebush are common native shrubs, multiflora rose, burning bush, shrub honeysuckle, autumn olive, and mimosa are more abundant. Most of the groundcover understory is composed of invasive species including Japanese stiltgrass, garlic mustard, mile-a-minute, Japanese honeysuckle, English ivy, and bittersweet.

#### **HABITAT 17: FLOODPLAIN FOREST**

Open areas located in the floodplain forest along the Patuxent River are composed of a pin oak- black walnut overstory with 6"-12" DBH's and a predominantly boxelder understory with 1"-6" dbh's. Tree regeneration and shrub components observed in the herbaceous layer (<1"dbh) includes spicebush and boxelder. Herbaceous species observed include: Virginia knotweed (*Polygonum virginiana*), Pennsylvania smartweed, false nettle, jack-in-the-pulpit, marsh smartweed, deer tongue, poison ivy, christmas fern and grape. This area also has a very dominant non-native invasive plant component comprised of garlic mustard, Japanese honeysuckle, Japanese stiltgrass, oriental bittersweet, bush honeysuckle, mile-a-minute, English ivy and multiflora rose.

#### **HABITAT 18: RIPARIAN FOREST EDGE**

This young community is an ecotone of the forests of Habitats 17, 10 and 6. This forest is composed of 6-12" tulip poplar, black cherry, white pine and silver maple with a 2-4" dogwood and black cherry sub-canopy. Multiflora rose, garlic mustard and shrub honeysuckle make up the invasive shrub layer. Invasive management and native shrub plantings are restoration opportunities for this site.

#### **HABITAT 19: FLOODPLAIN FOREST**

This forest forms the riparian corridor for the middle section of the stream flowing through the Merriweather site. Much of the overstory is sycamore, white oak, tulip poplar, hickory, red maple and beech (18-24"). The mesic understory contains a variety of small trees and shrubs including arrowwood, ironwood, dogwood, and black cherry. There are indications here of remnant landscaping as well, including very large yews. Invasives are prevalent and include English ivy, mile-a-minute, multiflora rose, Japanese honeysuckle, bradford pear, and burning bush. Groundcover and herbaceous plants found here include Virginia creeper, grape, jewelweed, Pennsylvania smartweed, greenbriar, poison ivy, false nettle, pokeweed, and raspberry. Invasive management in this area would allow natural regeneration of existing native species to grow with reduced competition.

#### **HABITAT 22: REGENERATING MIXED HARDWOOD FOREST**

This forest can be described as a subset of Habitat area 1 occurring as unmaintained areas adjacent to the lawn, along an ephemeral channel. Many of the large dominant overstory trees of Habitat area 1 are included but an understory beech, dogwood, spicebush, and viburnum is present in the lack of maintenance. Invasives such as multiflora rose and autumn olive are present in this area but not to the extent that they are a dominant component.

# GLOSSARY

## GLOSSARY OF TERMS

**afforestation:** Establishing site appropriate native forest plants in areas where forest has been absent for an extend period.

**channel invert:** the lowest point of the cross section of a channel.

**corridor:** a linear habitat that may link patches (hubs) of habitat in the landscape and be a pathway for the movement of plants and wildlife.

**creation:** the establishment of wetland hydrology and plants, or forest vegetation in areas of the site not currently containing those conditions.

**DBH:** Diameter at Breast Height, diameter of the main trunk of a tree measured at 4.5 feet above the ground surface.

**enhancement:** improving an existing vegetative community through one or more of the following activities: the control of non-native invasive species, planting site appropriate native trees to augment natural regeneration seedlings, planting site appropriate native shrubs and herbaceous plants to increase forest diversity.

**green infrastructure:** an interconnected network of open spaces and natural areas, such as greenways, wetlands, parks, forest preserves and native plant vegetation.

**hub:** large contiguous blocks of ecologically important natural land area

**NRA:** Natural Resource Assessment

**reforestation:** establishing site appropriate native forest plants in areas where forest has been removed.

**riparian:** the area adjacent to streams, lakes, or wetlands

**stream reach:** a relatively homogenous segment of a stream that has beginning and ending points and defined by identifiable repeating structural characteristics or processes.

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