# SECTION 5: SUBWATERSHED MANAGEMENT PLANS

Conditions and watershed management concerns vary across each of the nine subwatersheds, including Little Creek reservoir, the mainstem non-tidal and tidal creek segments. This section contains a detailed profile for each of these areas, with respect to current and future impervious cover; estimated developable area; stream habitat conditions, locations of trash dumping, presence of wetlands, fossilized shell marl areas, contiguous forest, locations of rare, threatened and endangered species; priority stream restoration and retrofit sites.

Subwatershed maps have also been created to accompany the text and serve as a blueprint for the protection and restoration of the Yarmouth Creek watershed. They also can be used as a tool in which to review future development projects, negotiate proffers, or review re-zoning requests. The maps contain priority conservation areas such as contiguous forest tracts, sensitive streams and locations of rare, threatened or endangered species. The maps also contain locations for priority retrofit sites, stream restoration and trash cleanups. Zoning is also included on the maps according to the categories as follows.

**A1** General Agricultural District
**B1** General Business District
**LB** Limited Business District
**M1** Limited Business/Industrial District
**M2** General Industrial District
**MU** Mixed Use District
**PUD-C** Planned Unit Development District
**R1** Limited Residential District
**R2** General Residential District
**R4** This district is intended to permit development, in accordance with a master plan, of large, cluster-type communities
**R5** Multifamily Residential District
**R6** Low-Density Residential District
**R8** Rural Residential District
**RT** Research and Technology District

The watersheds are organized into the Upper and Lower Subwatersheds because of their physical proximity to each other and the ability to combine maps for the Lower watershed. The Upper subwatersheds include Subwatersheds 102,103,104, 105 and Little Creek Reservoir. The Lower subwatersheds include Subwatersheds 101, 102, Non-tidal Mainstem and Tidal Mainstem.

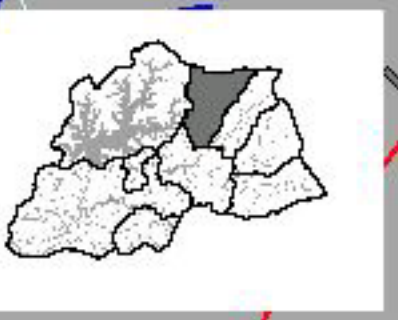
Richmond Rd.

Chickahominy Rd.

102-R4
YC-013

102-R2
YC-019

102-R1
YC-021



# Yarmouth Creek Watershed

# Subwatershed 102

Watershed
Subwatershed
Hydrology
Roads
Parcels
Buildings
NWI Wetlands

Potential Channal Stabilization/Restoration
Potential Conservation Areas
Priority Retrofits
Trash/Debris
Sensitive Fish
PSA

Developable Parcels (1997 Zoning)
A1
B1
LB
M1
M2
MU
R1
R2
R8

N

4000 0 4000 8000 12000 Feet

# UPPER SUBWATERSHEDS

## Subwatershed 102

**Overall Characterization**

This subwatershed currently has 7.3% impervious cover, and it is projected to have a buildout imperviousness of 11.5%, which would shift its classification from SENSITIVE to IMPACTED. The subwatershed is moderately developed with residential areas and some commercial areas in the upper portion. There are some good quality forest areas and mature forested stream buffers. The upper stream reaches are somewhat degraded (scored fair on RBP), with trash in the stream; however, conditions improve as one moves downstream. Six fish species were found at a sampling site in the upper tributary and streams in the lower portion of the watershed received excellent habitat scores. Two dry pond retrofit sites were identified that needed maintenance and could be unclogged or retrofit to provide wet storage and better channel protection downstream.

**General Characteristics**

| | |
|---|---|
| *Drainage Area* | 870 acres |
| *Length of Mapped Streams* | 4.14 miles |

**Current Land Use and Stream Classification in Subwatershed 102**

| | |
|---|---|
| *1996 Impervious Cover* | 7.3% |
| *Initial Stream Classification* | Sensitive |
| *Current Stream Condition* | Good |

**Future Land Use and Stream Classification in Subwatershed 102**

| | |
|---|---|
| *Buildout Impervious Cover* | 11.5% |
| *Projected Stream Classification* | Impacted |
| *Developable Area* | 445.7 acres |
| *Developable Area %* | 51% |

**Conservation Areas in Subwatershed 102**

| | |
|---|---|
| *Existing RPA wetland area* | 2.8 acres |
| Existing RPA wetland % | < 1% |

*Presence of RTE species:* The shell-marl ravine forest is likely to be found in the upper section although no shell deposits were observed in the field.

*Wetlands (from NWI):* 43.5 acres of wetlands (5% of subwatershed), mostly riparian. High quality wetlands associated with the floodplain occur along with beaver dams in the lower portions of the subwatershed.

*Other Conservation Areas:* none identified

**General Stream Conditions in Subwatershed 102**

*Habitat Assessment:* The upper stream reaches are somewhat degraded (scored fair on RBP), with trash in the stream; however, conditions improve as one moves downstream. Only six fish species were found at a sampling site in the upper tributary reflecting the somewhat degraded conditions found there. Streams in the lower portion of the watershed had higher habitat scores and were in good condition.

**Stormwater Management in Subwatershed 102**

There is a school and some residential development in this upper subwatershed. A quick survey of stormwater facilities revealed two facilities that are subject to clogging and could receive a retrofit to improve water quality protection. The remaining facility would benefit from the addition of a forebay. Descriptions of these facilities are provided below.

**Table 102-1. Retrofit Opportunities in Subwatershed 102**

| ID | Facility Type | Description | Comments | Priority |
|---|---|---|---|---|
| 102-R1 | Existing Dry Pond | Enhancements including addition of a sediment forebay, and creation of a wet pool area to incorporate greater water quality. Also, remove debris from clogged outlet. | Some trash at outlet. Simple retrofit. | Moderate |
| 102-R2 | Existing Dry Pond | Enhancements including addition of a sediment forebay, and creation of a wet pool area to incorporate greater water quality. | Some trash at outlet. Simple retrofit. | Moderate |
| 102-R4 | Existing Wet Pond | Possible addition of a forebay. | Simple retrofit. Otherwise nice facility. | Moderate |

Richmond Rd.

103-R3

103-R1

YC-006

103-R2

YC-023

103-S1

# Yarmouth Creek Watershed

# Subwatershed 103

Watershed
Subwatershed
Hydrology
Roads
Parcels
Buildings
NWI Wetlands

Potential Channal Stabilization/Restoration
Potential Conservation Areas
Priority Retrofits
Trash/Debris
Shell Deposits
PSA

Developable Parcels (1997 Zoning)
A1
B1
LB
M1
M2
MU
R1
R2
RS

N

900 0 900 1800 Feet

## Subwatershed 103

**Overall Characterization**

Subwatershed 103 currently has an impervious cover percentage of 5.1% and is classified as SENSITIVE. The subwatershed is projected to have a buildout imperviousness of 11.4%, which would shift its classification to IMPACTED. This subwatershed is lightly developed in the upper western portion and moderately developed in the upper eastern section with agricultural, residential and commercial areas. The upper eastern tributary is characterized by degraded stream conditions due to trash dumping issues and the invasive plant species Nepal microstegium. The upper western tributary is in good condition and the subwatershed contains good quality forested areas with shell-marl ravine forest. Stream conditions also tend to improve considerably as you progress downstream.

**General Characteristics**

| | |
|---|---|
| *Drainage Area* | 744 acres |
| *Length of Mapped Streams* | 4.94 miles |

**Current Land Use and Stream Classification in Subwatershed 103**

| | |
|---|---|
| *1996 Impervious Cover* | 5.1% |
| *Initial Stream Classification* | Sensitive |
| *Current Stream Condition* | Fair to Good |

**Future Land Use and Stream Classification in Subwatershed 103**

| | |
|---|---|
| *Buildout Impervious Cover* | 11.4% |
| *Projected Stream Classification* | Impacted |
| *Developable Area* | 502.2 acres |
| *Developable Area %* | 68% |

**Conservation Areas in Subwatershed 103**

| | |
|---|---|
| *Existing RPA wetland area* | 27.2 acres |
| Existing RPA wetland % | 4% |

*Presence of RTE species:* Shell deposits indicative of the shell-marl ravine forest are located in the upper watershed, though conditions in the eastern tributary are affected by the invasive carpet-like Nepal microstegium which out-competes native plant species limiting the likelihood of rare species.

*Wetlands (from NWI):* 40.4 acres of wetland (5% of subwatershed), mostly riparian. High quality wetlands associated with the floodplain occur along with beaver dams in the lower portions of the subwatershed.

*Other Conservation Areas:* None identified.

**General Stream Conditions in Subwatershed 103**

*Habitat Assessment:* The upper stream reaches are somewhat degraded (scored fair on the habitat assessment), with trash in the stream; however, conditions improve as one moves downstream. Six fish species were found at a sampling site in the upper tributary, most of which were relatively pollution tolerant and reflect the somewhat degraded conditions found there. Streams in the lower portion of the watershed had higher habitat scores and were in good condition.

**Stormwater Management in Subwatershed 103**

Several possible retrofits exist and are associated with commercial and highway runoff from the Rt. 60 corridor.

**Table 103-1. Retrofit Opportunities in Subwatershed 103**

| ID | Facility Type | Description | Comments | Priority |
|---|---|---|---|---|
| 103-R1 | Existing Wet Pond | Possible addition of a forebay. | Simple retrofit. Otherwise nice facility. | Moderate |
| 103-R2 | Infiltration Basin/Dry Pond | Infiltration basin which may be acting more like a dry pond<br>Possible orifice retrofit to provide downstream channel protection | Simple retrofit | Moderate /High |
| 103-R3 | No existing facility | Location where road runoff from Rt. 60 is entering the stream untreated possible linear bioretention facility in the median or on the side of the road | Would require design and coordination with VDOT | Moderate |

**Channel Stabilization in Subwatershed 103**

A small drainage channel is experiencing considerable erosion likely due in part to stormwater runoff. A stabilization concept can be found in Section 3 Watershed Recommendations.

**Table 103-2. Potential channel stabilization site in Subwatershed 103**

| Site | Description | Comments | Priority |
|---|---|---|---|
| 103-S1 | Small eroding stream in 103 primarily located on the Candle Factory Property | A good bioengineering project | High |

# Yarmouth Creek Watershed

# Subwatershed 104

Watershed
Subwatershed
Hydrology
Roads
Parcels
Buildings
NWI Wetlands

Potential Channel Stabilization/Restoration
Potential Conservation Areas
Priority Retrofits
Trash/Debris
Sensitive Fish
Shell Deposits
RTE Plant
Bald Eagle
Heron Rookery

Developable Parcels (1997 Zoning)
A1
B1
LB
M1
M2
MU
R1
R2
R5

PSA
US Homes

James City County

CENTER FOR WATERSHED PROTECTION

600 0 600 1200 Feet

N

104-R1
123-003

Richmond Rd.

104-S1

104-S2

C5

104-S3

## Subwatershed 104

**Overall Characterization**

Subwatershed 104 is currently in the SENSITIVE category at 9.0% impervious cover and under the current zoning was projected to have a buildout imperviousness of 11.6%, which would shift its classification to IMPACTED. Recently, a significant portion of the subwatershed was rezoned from agricultural to residential, which shifted the future impervious cover projection to 19.3%. Currently, the subwatershed is moderately developed with residential and commercial areas in the upper portion. The upper western tributary has been impacted by uncontrolled stormwater from an older residential development, and the stream appears to be straightening as well as carrying a an excess sediment load. The eastern and lower portions of the subwatershed have excellent stream conditions. A fish survey below the confluence of the two upper tributaries showed eight fish species including the sensitive brook lamprey. Good quality floodplain forest exists here as well as the shell-marl ravine forest, though the shell areas have been affected by the spread of invasive Nepal microstegium associated with the sewer line. Upland areas may provide habitat for the rare small whorled pogonia, which was recently located in this subwatershed by Williamsburg Environmental Group. This area contains relatively mature contiguous forest.

**General Characteristics**

| | |
|---|---|
| *Drainage Area* | 860 acres |
| *Length of Mapped Streams* | 3.78 miles |

**Current Land Use and Stream Classification in Subwatershed 104**

| | |
|---|---|
| *1996 Impervious Cover* | 9.0% |
| *Initial Stream Classification* | Sensitive |
| *Current Stream Condition* | Good |

**Future Land Use and Stream Classification in Subwatershed 104**

| | |
|---|---|
| *Buildout Impervious Cover* | 19.3% |
| *Projected Stream Classification* | Impacted |
| *Developable Area* | 573.6 acres |
| *Developable Area %* | 67% |

**Conservation Areas in Subwatershed 104**

| | |
|---|---|
| *Existing RPA wetland area* | 24 acres |
| *Existing RPA wetland %* | 3% |

*Contiguous Forest* Yes, 200 acre forested plot

*Presence of RTE species:* A small whorled pogonia population is located in the uplands and there are shell deposits indicative of the shell-marl ravine forest located in the upper watershed. Conditions in the eastern tributary are affected by the invasive Nepal microstegium.

*Wetlands (from NWI):* 42.7 acres of wetlands (5% of subwatershed), mostly riparian. High quality wetlands associated with the floodplain occur along with beaver dams in the lower portions of the subwatershed.

*Other Conservation Areas:* None found

**Table 104-1. Priority Conservation Areas in Subwatershed 104**

| Rank | ID | Approx. Area* (acres) | | Description | Score | Management Recommendations |
|---|---|---|---|---|---|---|
| | | Total | Developable | | | |
| 5 out of 8 | C5 | 190 | 140 | Subwatershed 104; sensitive stream, contiguous forest, shell-marl | 54 | Targeted for development; RPA protection for all first order streams, BSD |

*These are approximate areas calculated using GIS and rounded to the nearest tenth. Total area represents the total acreage within the conservation area boundary. The developable area within those conservation areas was calculated by subtracting unbuildable land and built-out land from the total area. Unbuildable land included the NWI wetlands, open water, the existing RPAs (not including RPA buffer), stream valleys (a 100-foot buffer on either side of all streams), and slopes greater than 25% (derived from 5-foot contour lines). Because this estimate was based on limited data and certain assumptions were made about how to estimate this area, it should only be used as a planning tool only and not as an actual guide for development.

**General Stream Conditions in Subwatershed 104**

*Habitat Assessment:* The upper western tributary has been impacted by uncontrolled stormwater from residential development, and the stream appears to be straightening as well as carrying a large sediment load. The eastern and lower portions of the subwatershed have good stream conditions. A fish survey below the confluence of the two upper tributaries showed eight fish species including the sensitive brook lamprey.

**Stormwater Management in Subwatershed 104**

There is an opportunity to retrofit the development on the western tributary to provide channel protection and limit downstream impacts of stormwater runoff. Another opportunity for stormwater retrofitting may be to expand the capacity of an infiltration basin to provide more storage.

**Table 104-2. Retrofit Opportunities in Subwatershed 104**

| ID | Facility Type | Description | Comments | Priority |
|---|---|---|---|---|
| 104-R1 | Infiltration Basin | Consider adding bioretention elements to enhance the facility. Mulch the base of the facility, and incorporate a variety of plants. | This facility is currently recorded as a dry pond. | Low |

**Stream Restoration/ Channel Stabilization in Subwatershed 104**

There is the potential for several stream stabilization and one potential stream restoration project in Subwatershed 104. The stream restoration project is associated with the degraded western tributary. However the source of the stormwater that is degrading the channel is undetermined. Treatment of the stormwater prior to restoration should be a prerequisite for this project. The bioengineering concept for the restoration project is located in Section 3 Watershed Recommendations. Descriptions of the potential channel stabilization projects are located in Table 104-3.

**Table 104-3. Stream Restoration/ Channel Stabilization Opportunities in Subwatershed 104**

| Site | Description | Type of Effort | Priority |
|---|---|---|---|
| 104-S1 | Reach of stream adjacent to the west side of the Kristansand neighborhood in Subwatershed 104 | Stream restoration -Should be combined with a retrofit, habitat and stability should be restoration goals. | Medium |
| 104-S2 | Two reaches on the south side of Kristansand neighborhood experiencing streambank erosion and headcutting | Channel stabilization | Medium |
| 104-S3 | Two small headwater channels with active headcuts in subwatershed 104 downstream of the proposed US Homes development | Channel stabilization | Medium |