

Foreword

The Yarmouth Creek Watershed Plan is the culmination of a year and a half process led by the Center for Watershed Protection that began in the summer of 2001 with initial mapping and existing data collection. That work was followed in the fall by fieldwork that included a stream assessment, a conservation area assessment and a brief stormwater survey. The *Baseline Assessment* was completed in January 2002, followed by a stakeholder meeting coordinated with the James River Association and James City County on the initial findings in early February. The *Conservation Area Report for Yarmouth Creek* was completed in June 2002 and the *Technical Memo on the Reduced Freshwater Flow in Yarmouth Creek* was produced in July 2002. A second stakeholder meeting occurred in September in which stakeholders helped craft goals for the overall plan. This initial draft for the final watershed plan was completed in January 2003.

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EXECUTIVE SUMMARY

This watershed management plan provides a summary of the stakeholder process conducted by the Center for Watershed Protection (CWP), James River Association (JRA) and James City County (JCC) and the reports produced over the past year and a half as part of the Yarmouth Creek planning process. The reports included; the Yarmouth Creek *Baseline Assessment*, *Conservation Area Report for Yarmouth Creek*, and a *Technical Memo on the Reduced Freshwater Flow in Yarmouth Creek*. A watershed management plan and associated maps have been drafted for the nine subwatersheds in Yarmouth Creek based on the eight tools of watershed protection (CWP, 1998). These subwatershed management plans and associated maps serve as blueprints for the protection and restoration of Yarmouth Creek. They may also be used as planning maps for the implementation of the watershed management plan and as an important tool during the development review process.

The sixteen square mile Yarmouth Creek watershed is truly a state treasure. A recent natural areas inventory, conducted by the Virginia Department of Conservation and Recreation, Division of Natural Heritage (VDCR), classified portions of the watershed as highly significant to biodiversity in the state (Clampitt, 1991). Along the remarkably undisturbed shoreline of mainstem Yarmouth Creek are extensive complexes of forested uplands, bald cypress swamps, and rare types of tidal freshwater marsh. These tidal wetlands are considered by VDCR to be one of the two largest relatively undisturbed wetlands on the lower peninsula of Virginia. Yarmouth Creek and its 1523 acres of wetlands provide habitat for a diversity of fish, waterfowl, and wildlife, which collectively contribute to the area's exceptional recreational value for hunting, fishing, bird watching and nature enjoyment. Additionally, these areas are home to at least one known heron rookery, a number of historic bald eagle nesting sites, and several globally rare or threatened plant species including the sensitive joint vetch, and narrow-leaved spatterdock.

Presently, the Yarmouth Creek watershed is lightly developed, but it is coming under greater development pressures, particularly in its northern headwaters. The majority of the watershed is zoned agricultural-forestal, but pressure to re-zone for residential development has become a recent issue. Developments within the upper portion of the watershed rely on public sewer, while most of the existing developments in the lower watershed rely on septic systems for wastewater disposal. The upper watershed is a mix of agricultural, residential and commercial land-uses. The lower watershed, dominated by tracts of forest, provides for forest related activities such as timber harvesting and organized hunting. The Yarmouth Creek Watershed Plan represents an excellent opportunity to protect and preserve the unique environmental resources, while allowing for development that does not destroy the natural conditions of the Creek.

Rapid development without adequate protection will most likely lead to a degradation of pristine natural resources in the watershed. The amount of impervious cover is often a good indicator of the extent land development. Research from around the country has

shown that stream and wetland quality begins to decline when the amount of impervious cover in a watershed exceeds approximately 10% (Schueler, 1994).

The principal effects of impervious cover in Yarmouth Creek include:

- Changes in the hydrology of streams, wetlands and floodplains
- Increased pollutant loads delivered in urban stormwater (bacteria, sediment, nutrients)
- Channel erosion in headwater streams
- Water level fluctuations that degrade wetlands
- Favors the establishment of invasive plant species
- Fragmentation of contiguous forests
- Increased flooding
- Reduction of baseflow of streams

Based on the Center's stream impervious cover model, all nine subwatersheds were classified as sensitive (CWP, 1998). If we consider future growth, four of these subwatersheds are expected to move into the impacted category. However, future growth in the watershed remains uncertain as areas can be re-zoned.

Watershed residents and other stakeholders including representatives from local businesses, developers and agencies played a vital role in the creation of this watershed management plan. Stakeholder involvement is a key ingredient in a watershed plan as stakeholders must live with the decisions that are made. They also bring issues to the table that are important to them and participation gives them a stake in the outcome and helps to ensure plan implementation. It was their insight into the problems within the watershed that led to two additional studies: a field assessment of the Little Creek reservoir subwatershed and a memo investigating the increase in salinity in the Yarmouth Creek watershed. The stakeholder process involvement in the Yarmouth Creek plan consisted of three public meetings; the first covered the baseline assessment and fieldwork performed by the Center; and the second engaged participants in the process of setting goals and the third will cover the recommendations in the final plan. The six overall watershed protection and restoration goals identified for the plan by the stakeholders are:

1. Prevent further degradation of water quality in Yarmouth Creek and maintain the outstanding quality of tidal and nontidal mainstem wetlands.
2. Respect the rights of landowners in the watershed plan recommendations and ensure that the cost of conservation is shared by the entire community, not just individual landowners.
3. Develop in a manner that is consistent with the protection of the high quality natural resources in Yarmouth Creek.
4. Work toward the formation of a citizen group to facilitate future participation and protection of Yarmouth Creek. Suggestions included:
 - Educate people about watershed awareness including litter and boat wakes). Promote active stewardship among residents, community associations, businesses, and seasonal visitors.
 - Work with neighbors to develop a vision for individual properties
 - Work with the county on shared goals

5. Minimize the local practices that increase salinity concentrations in the freshwater ecosystem of Yarmouth Creek and further investigate a minimum flow rate for Little Creek Reservoir.
6. Enhance stewardship of Yarmouth Creek by specifically addressing the litter issue and shoreline erosion due to boat wakes.

Process

The 16 square mile Yarmouth Creek watershed was divided into nine subwatersheds ranging from one to four square miles in area to create individual planning units (Figure E-1). Land use and impervious cover were analyzed for each subwatershed to provide preliminary expectations for current and future water quality and habitat conditions. Field conditions and conservation areas were evaluated to check expectations developed in the land use and impervious cover analysis. Together with the results of our conservation area work and the stream habitat assessment, draft goals were created for subwatersheds based on scientific assessment and existing and potential future land use. It was determined that Yarmouth Creek includes a mix of relatively high quality subwatersheds with considerable biodiversity and a number of subwatersheds that exhibit localized degradation of stream conditions especially in the upper portion of the watershed near Richmond Road. (Rt. 60).

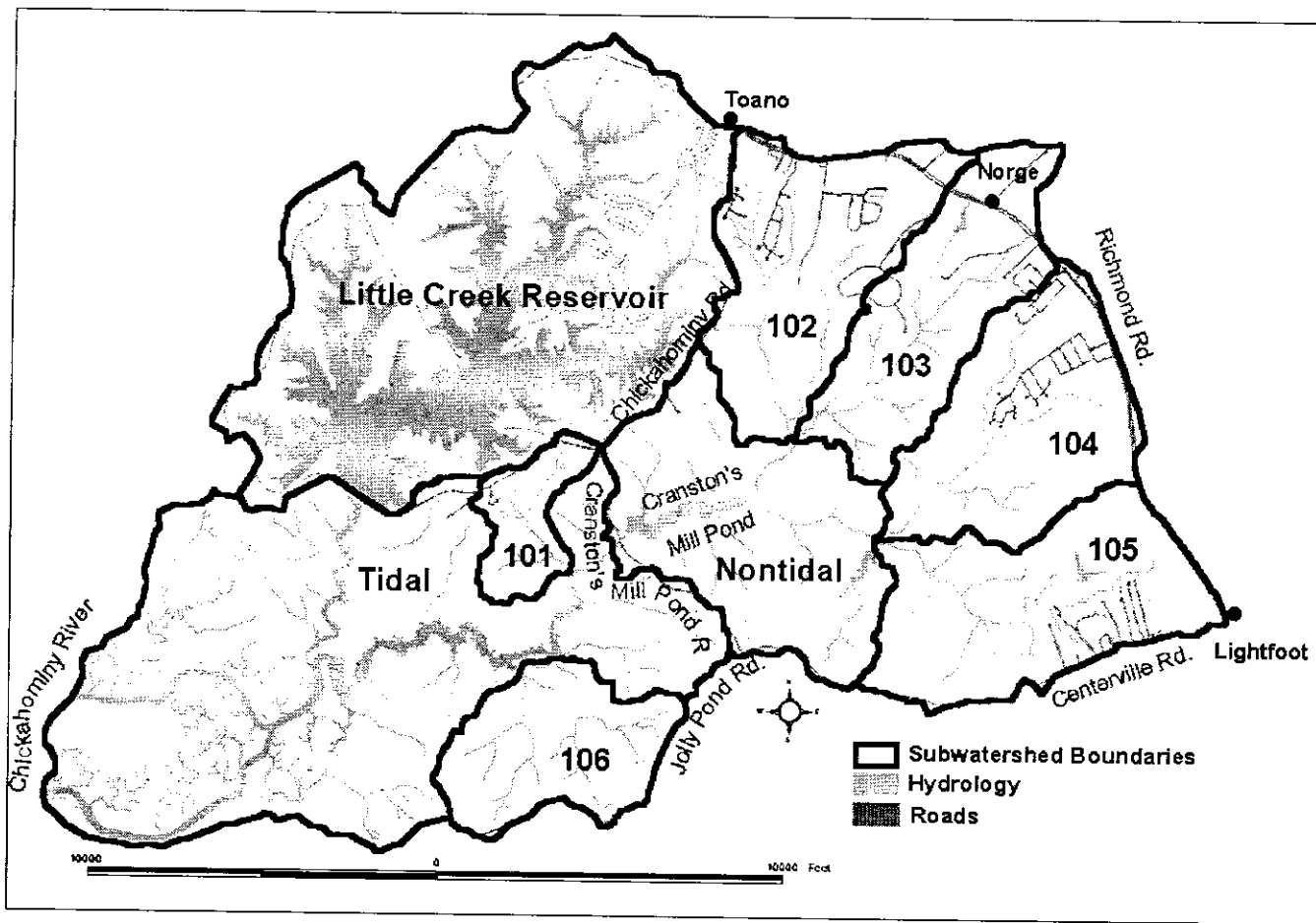


Figure E-1. Yarmouth Creek Subwatershed Map

Table E-1. provides a summary of the subwatershed goals as well as both the current and future impervious cover for each subwatershed based on the current zoning. These goals represent some of the responses that were echoed at the stakeholder meetings about how to manage individual subwatersheds. General agreement was reached for responsible development in the upper watershed and perhaps more conservation and protection in the lower tidal portion of the watershed. However, it was also clear that imposing conservation on individual property owners was not a favorable approach for the landowners. At the same time, there was a goal of preventing further degradation in the entire watershed by using stormwater retrofits, effective stormwater management, stream restoration and watershed education programs.

Table E-1. Subwatershed Goals

Subwatersheds	Current/ Future Status	Watershed Goals	Tools
101, Mainstem tidal, Mainstem non-tidal, 106, Little Creek Reservoir	Sensitive / Sensitive <i>less than 10% impervious cover</i>	Preserve the important mainstem tidal portion of the creek (conservation areas, sensitive streams and contiguous forest) without impeding private property rights	<ul style="list-style-type: none"> ➤ Voluntary conservation and acquisition programs ➤ Close work with the Landowner watershed group ➤ Protect open space, when development does occur and attempt to minimize the impacts
102, 103, 104, 105	Sensitive / Impacted <i>10 -25% impervious cover</i>	Restore degraded streams and protect streams from further degradation	<ul style="list-style-type: none"> ➤ Implement watershed education and stewardship programs ➤ Stormwater retrofits ➤ Stormwater practices ➤ Stream restoration

Recommendations

Prioritized implementation recommendations for the Yarmouth Creek watershed are summarized in Table E-2. These recommendations are prioritized based on how well they achieve stakeholder watershed goals and their importance to successful watershed management as gauged by CWP and JCC technical staff. Preliminary cost estimates and potential responsible parties have been identified so that financial resources can be allocated and staff roles can be defined. Real watershed protection requires a multi-faceted approach that combines land use and preservation decisions with on-the-ground implementation, education and protection of watershed functions. This approach strives for permanent protection, and attempts to minimize long-term costs by implementing proactive, preventative solutions. An estimated \$160,000 a year over four years is our planning level estimate of the funding needed to implement the recommendations. This

number would increase considerably with a larger purchase of development rights program or conservation easement program that would need to be funded at one million dollars a year for at least four years to be relatively successful. Long-term protection of water quality, fisheries, forest and biodiversity have quantifiable community benefits including increased property values and enhanced quality of life, which compound over time. More details on the economic benefits of watershed protection can be found in Appendix A. Detail for each of the priorities in Table E-2 can be found in Section 3 Watershed Recommendations.

Table E-2. Priorities and Costs for Watershed Protection and Restoration in Yarmouth Creek

Priority	Goals Achieved	Protection Tool or Evaluation Measure	Where	Costs to JCC and Action	Responsibility
1	1,3,6	Use of subwatershed maps to ensure local staff and stakeholder awareness of existing locations for restoration and potential conservation areas	Watershed wide	Small	JCC Planning, Development Management, Environmental Division
2	1,2,4	Foster development of a watershed group for Yarmouth Creek led by the landowners/ stakeholders in the Creek	Watershed wide	Small Consider initial seed money	Stakeholders, JCC Planning, Development Management, Environmental Division
3	1,2,3,5	Adopt Special Stormwater Criteria (SSC) in the Watershed to increase groundwater recharge in the development process	Sub-watersheds in PSA and re-zonings watershed wide	Small Criteria should be the same as Powhatan	Environmental Division
4	1,5	Establish a working group to address salinity issues and consider min flow from Little Creek	Tidal Yarmouth Creek	Small 0.1 FTE	Stakeholders, Development Management, Environmental Division
5	1,2	Work with stakeholder watershed group to conserve land through purchase development rights/ easements in sensitive areas	Watershed wide	Expensive 1million a year for 4 years	PDR Program, Development Management

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Priority	Goals Achieved	Protection Tool or Evaluation Measure	Where	Costs to JCC and Action	Responsibility
6	1,2	Perform 4 stormwater retrofits	Sub-watersheds 102, 103, 104, 105	Expensive \$50k a year for 4 years	Environmental Division, Development Management
7	1,2	Perform stream restoration and channel stabilization projects	Sub-watersheds 103, 104	Expensive \$100k** a year for 4 years	Environmental Division, Development Management
8	1,2,3	Maintain priority of Purchase of Development Rights (PDR) program for special resource areas including buffers and conservation areas	Watershed wide	Small	PDR Program, Development Management
9	1,6	Meaningfully address trash issues in the watershed Arrange cleanups and work with stakeholder group to change behavior	Watershed wide	Small 0.1 FTE \$500 year for roll off dumpster rental	Environmental Division, Solid Waste Division
10	1,2,3,4	Encourage Better Site Design across the watershed and the county by improving code language and having a roundtable – a series of meetings with developers, VDOT, JCC staff and other stakeholders	Watershed wide	Moderate 0.5 FTE for a planner	Stakeholders, Developers, JCC Planning, Development Management, Environmental Division
11	1,4,5	Monitor salinity in Yarmouth Creek in cooperation with the stakeholder watershed group	Tidal Yarmouth Creek	Small \$100 in equipment	Stakeholder watershed group

Table E-2. Priorities and Costs for Watershed Protection and Restoration in Yarmouth Creek

Priority	Goals Achieved	Protection Tool or Evaluation Measure	Where	Costs to JCC and Action	Responsibility
12	1,4,6	Signage and educational materials to begin to address boat wake issues	Tidal Yarmouth and Chick boat ramps	Small \$1-2k over two years	Stakeholder watershed group, Environmental Division, Development Management
13	4,6	Monitor restoration efforts on stream channels and biota	Watershed wide	Small to Moderate 0.2 FTE or \$5k a year sub to W&M	Environmental Division, Development Management
14	1,2	Continue to strengthen enforcement of existing RPA laws on new development and as stated in the law protect all perennial streams and connected wetlands	Watershed wide	Small	Development Management, Environmental Division
Total	\$160k a year over 4 years + additional 1 million a year for an expanded PDR program and .75 FTE				

FTE- Full-time employee
 JCC- James City County
 PDR- Purchase of Development Rights
 VIMS- Virginia Institute of Marine Science

Costs
 Small – Less than 5k
 Moderate -- \$5-40k
 Expensive >40k

** Bioengineering costs based on (City of Asheville, 1998) costs of \$25-\$55 linear ft

Another key component of this watershed plan is measuring and monitoring the success of the plan. In Yarmouth Creek, this consists of monitoring the effects of management measures on stream channel stability, water quality, RTE species and impervious cover. This will enable county staff to learn from the successes and challenges of plan implementation and craft better strategies in the future.