

Upper Cabin John Creek Watershed Management Study

City of Rockville, Maryland

December, 1994

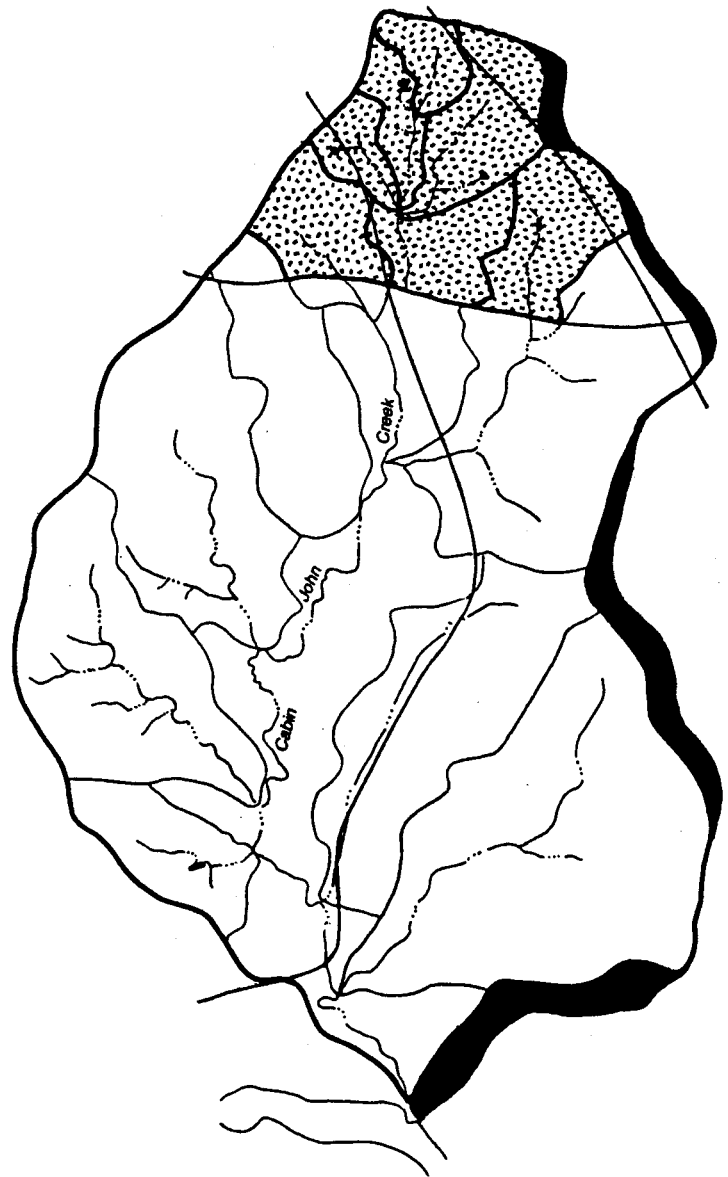
produced by:

Department of
Environmental
Programs

Metropolitan
Washington
Council of
Governments

for the:

City of
Rockville
Department of
Public Works
Stormwater
Management
Division



**Upper Cabin John Creek Watershed
Management Study**

-Final Report-

Prepared For:

**The City of Rockville
Department of Public Works
Stormwater Management Division**

Prepared by

**John Galli
and
Phong Trieu**

**Department of Environmental Programs
Metropolitan Washington Council of Governments
777 North Capitol Street, N.E.
Washington, D.C. 20002**

December, 1994

Acknowledgements

The authors would like to thank a number of individuals whose support, cooperation and patience were critical to the completion of this study. In particular the patience of Ms. Susan Straus (DPW Project Manager) and Ms. Janette Fearon was greatly appreciated. The authors would also like to extend their gratitude to Mr. Tim Hall for his input. Special thanks are also extended to Mr. Richard Claytor (Loiederman Associates, Inc.) and Dr. Chris Athanas (Athanas and Associates, Inc.) for their expertise. In addition, the authors are indebted to Mr. Jim Shell and Mr. Stuart Freudberg (MWCOG) for their support and guidance. Last, the authors wish to extend their many thanks to Ms. Eva Cooper, Ms. Jacquelyn Seneschal, Ms. Lela Lange, Ms. Earline Simons, Mr. Jay Lawson and Mr. Mark P. Pfoutz (all MWCOG) for their incredible assistance in the preparation of the report.

Table of Contents

	Page
Acknowledgements	i
List of Figures	ii
List of Tables	iii
Executive Summary	iv
Introduction	1
Chapter 1. Existing Stream Quality Conditions - RSAT Survey Results	
A. Background	3
B. Summary: RSAT Survey Results	4
Elwood Smith Tributary	6
Upper Cabin John Creek	6
Dawson Farm Creek	11
Seven Locks Tributary	13
Lower Cabin John Creek	13
Bogley Branch	16
Old Farm Creek	16
Chapter 2. Stormwater Management Retrofit Opportunities	
A. SWM Regulations	21
B. Major Undeveloped Land in the Cabin John Creek Watershed	22
C. Existing Key Regional SWM Facilities	22
D. Stormwater Management Retrofit Approach	26
E. Summary: SWM Retrofit Evaluation and Recommendations	26
1-A. Fleet Street	32
1-B. Mount Vernon Place Regional SWM Facility	32
2. Elwood Smith Park	33

Table of Contents

	Page
3. Rockville Heights Regional SWM Facility	33
4. Hungerford Swim Center	33
5. New Mark Commons Lake	35
6. Dogwood Park	36
7. Seven Locks/Detention Center Tributary No. 2	36
8. Dawson Farm Park Regional SWM Facility	36
9. Wootton Parkway - Dawson Farm Creek Channel	38
10. Potomac Woods Park No. 1	38
11. Potomac Woods Park No. 2	39
12. Potomac Woods Park No. 3	39
13. Locks Pond Court	39
14. North Farm SWM Facility	40
15. Woodmont Country Club - E. Jefferson Street	40
16. Montrose Park	41
Other Potential SWM Retrofit Sites	41
Cabin John Lake	42
Chapter 3. Stream Restoration Needs and Opportunities	
A. Key Stream Problem Areas	43
B. Existing Fish Barriers	46
Chapter 4. Wetland Creation and Riparian Reforestation Opportunities	
A. Non-SWM Wetland Creation Opportunities	50
B. Recommended Riparian Reforestation Areas	53
Glossary of Terms	56
References	59
<u>Appendix A.</u> RSAT Background Information	60
RSAT Evaluation Method	61
Example - RSAT Field Survey Form	65
RSAT Project Prioritization	68
<u>Appendix B.</u> Summary: RSAT Step One Stream Survey Findings ...	70
<u>Appendix C.</u> SWM Retrofit Concept Sketches	74
<u>Appendix D.</u> Preliminary SWM Retrofit Cost Estimate Breakdown	90

List of Figures

Figure		Page
1.	Cabin John Creek Watershed Management Study Area	5
2.	Elwood Smith Tributary: RSAT and Priority Ranking Scores	7
3.	Elwood Smith Tributary: Severe Channel Erosion	8
4.	Upper Cabin John Creek: RSAT and Priority Ranking Scores	9
5.	Upper Cabin John Creek: Severe Channel Erosion	10
6.	Dawson Farm Creek: RSAT and Priority Ranking Scores	12
7.	Seven Locks Tributary: RSAT and Priority Ranking Scores	14
8.	Lower Cabin John Creek: RSAT and Priority Ranking Scores	15
9.	Bogley Branch: RSAT and Priority Ranking Scores	17
10.	Bogley Branch: Severe Channel Erosion	18
11.	Old Farm Creek: RSAT and Priority Ranking Scores	19
12.	Major Undeveloped Land	23
13.	Cabin John Creek: SWM Retrofit Evaluation Sites	27
14.	Hungerford Swim Center - Conceptual Off-Stream ED Marsh	34
15.	Dawson Farm Park - Conceptual Two-Cell ED Marsh	37
16.	Cabin John Creek: Recommended Stream Restoration Areas	44
17.	Cabin John Creek: Existing Complete Fish Barriers	47
18.	Cabin John Creek: Proposed Non-SWM Wetland Creation Sites	51
19.	Cabin John Creek: Recommended Reforestation Areas	54

List of Tables

Table	Page
1. Summary: Cabin John Creek Rapid Stream Assessment Technique (RSAT) Survey Results	4
2. Cabin John Creek: Existing Regional-Type SWM Facilities	24
3. Summary: Cabin John Creek SWM Retrofit Project Evaluation (Part One)	28
4. Summary: Cabin John Creek SWM Retrofit Project Evaluation (Part Two)	29
5. Summary: Cabin John Creek SWM Retrofit Project Evaluation (Part Three)	30
6. Summary: SWM Retrofit Priority Rating	31
7. Recommended Stream Channel Stabilization/Restoration Areas	45
8. Preliminary Evaluation of Existing Fish Barriers	48
9. Recommended Non-SWM Wetland Creation Areas	52
10. Recommended Riparian Reforestation Sites	55

Executive Summary

The purpose of this study was four-fold: 1.) perform a detailed field survey of streams in the City of Rockville's portion of the Cabin John Creek watershed so as to provide an accurate assessment of current physical, chemical and biological conditions, 2.) develop a technical watershed management plan which comprehensively addresses possible stormwater management, stream restoration, wetland creation and reforestation opportunities, 3.) evaluate both the existing Mount Vernon Place and Dawson Farm Park stormwater management facilities for possible wetland creation/water quality retrofit opportunities and 4.) develop a ranking system to prioritize all water resource projects identified by the study.

In order to accomplish the preceding objectives, COG staff reviewed previously completed stormwater management (SWM) and ecological studies for the study area, applied its Rapid Stream Assessment Technique (RSAT) in the evaluation of over five stream miles in the City's portion of the watershed, developed a comprehensive inventory of potential watershed stormwater retrofit, stream restoration, wetland creation and reforestation projects, performed preliminary analyses of both estimated retrofit project cost and expected watershed benefits and developed a simple ranking system to prioritize possible restoration projects.

Based on the results from this study, several major conclusions and recommendations regarding present conditions in the Cabin John Creek system, as well as, the measures which could be taken to improve the overall environmental health of the watershed can be made:

1. RSAT results indicated that the quality of all of the streams surveyed in the study area can be verbally categorized as being in fair condition. The observed moderate levels of stream impairment are not surprising given the highly urbanized character of the watershed. Among the more commonly noted physical, chemical and biological signs of degradation were: excessive channel widening and/or downcutting, reduction in the wetted perimeter width, highly embedded riffle substrate, the formation of large, unstable point bars within the channels, high substrate fouling levels, loss of aquatic habitat through stream enclosure and/or channelization, and the presence of pollution-tolerant macroinvertebrate communities with characteristically low species diversity. Of the 10 stream areas surveyed in the study, the Seven Locks Tributary and the Dogwood Park tributaries received the highest and lowest RSAT scores, respectively (28 out of 50 points for Seven Locks Trib. and 20 out of 50 points for the Dogwood Park Trib.) Without question, the leading cause of most of the preceding problems is excessive inputs of uncontrolled stormwater runoff.
2. Results from this study revealed that approximately 60-70 percent of the developed portion of the study area has no SWM controls. The large amount of uncontrolled area is largely due to the age of the development in the watershed (i.e., pre-SWM control era).

3. Because three out of the seven subwatersheds surveyed (i.e., Elwood Smith Tributary, Upper Cabin John Creek and Bogley Branch) are essentially at or near ultimate land use conditions and have from a hydrologic standpoint reached the so-called 'dynamic equilibrium', major additional stream quality degradation in those catchments is unlikely. However, four out of the seven (i.e., Old Farm Creek, Lower Cabin John Creek, Dawson Farm Creek and the Seven Locks Tributary) still contain large amounts of developable land. Therefore, the provision of effective on-site and off-site SWM water quantity and quality controls will be paramount in maintaining and/or improving stream quality conditions in those subwatersheds.
4. The restoration of the Cabin John Creek stream system will require a SWM retrofit approach which maximizes the level of stream channel erosion protection and water quality control for existing developed areas in each of the seven sub-basins. It should be recognized that SWM retrofits will need to be located on both public and private land.
5. In general, stream channel erosion protection is best achieved through the employment of extended detention (ED) - type controls. While numerous water quality best management practices (BMP's) currently exist, wet ponds and artificial marshes are virtually alone in demonstrating a general ability to continue to function as designed for relatively long periods of time without routine maintenance. For the preceding reasons, the recommended SWM retrofit approach for drainage areas over 10 acres in size is generally a wet ED-type system. It is also recognized that as existing developed areas redevelop, in particular commercially-zoned land, that new on-site SWM retrofit water quality opportunities (such as sand filter and bioretention type BMP's) may also arise.
6. Based on its review of current City of Rockville SWM policy, COG staff strongly recommend that the City consider abandoning its present 10/2 water quantity control criteria in favor of the 2/2 approach presently being employed by Montgomery County. In COG staff's opinion, a flexible SWM retrofit program (which balances water quantity and quality control objectives) is necessary for the long-term restoration of the Cabin John Creek system. Programmatically, it should also be recognized that such a restoration effort will require a major long-term commitment of City resources.
7. A total of 17 possible SWM retrofits were identified in the study. Out of these 17, 14 were recommended for further engineering analysis. The following six SWM retrofits were given a high priority rating by COG staff:

<u>Subwatershed</u>	<u>SWM Retrofit Name</u>	<u>Approximate Cost(\$1000)</u>
1. Elwood Smith Tributary	Mount Vernon Place *	110K
2. Upper Cabin John Creek	Hungerford Swim Center	372K

3. Dawson Farm Creek	Dawson Farm Park *	125K
4. Bogley Branch	Potomac Woods No. 2	241K
5. Bogley Branch	Locks Pond Court *	28K
6. Old Farm Creek	Montrose Park	100K

* existing SWM dry pond	Sub-Total	<u>976K</u>
-------------------------	-----------	-------------

Note, costs shown do not reflect engineering and design work, possible land acquisition, possible environmental mitigation, possible utility relocation and/or contingencies.

8. Four major stream restoration areas, totalling approximately 2810 feet in length, were identified in the study. All four areas are presently experiencing severe channel erosion problems. The four stream reaches were ranked by COG staff and placed in the following restoration priority order: a.) Upper Cabin John Creek (1130 feet), b.) Elwood Smith Tributary (250 feet), c.) Bogley Branch (1030 feet), and d.) Dogwood Park Tributary (400 feet). It is strongly recommended that stream restoration projects generally not be initiated until upstream SWM controls are in place. Whenever possible, stream restoration projects should be specifically linked to an upstream SWM retrofit project(s). COG staff further recommend that both SWM and stream restoration efforts be initially concentrated within the Elwood Smith Tributary and Upper Cabin John Creek subwatersheds. The estimated total cost for the preceding stream restoration projects is \$350,000.
9. During the course of its stream survey work, COG staff recorded the presence of six complete fish barriers. From a fisheries standpoint, the existing Wootton Parkway culvert at Cabin John Creek is the most critical. Shallow laminar flow conditions in the upstream portion of the existing box culvert are creating the blockage. This culvert should be modified as soon as possible so as to restore normal fish passage to Upper Cabin John Creek.
10. A total of five non-SWM wetland creation projects and eight possible riparian reforestation sites were identified and recommended by the study. As envisioned, a total of 1.25 wetland acres and 3.47 acres of riparian forestland would be created by these projects. Both types of projects are an integral part of the overall watershed restoration strategy. The estimated cost for the proposed wetland creation work is \$54,700. Although no cost estimates were prepared for the riparian reforestation work, several of these appear to be well-suited for low cost citizen-volunteer projects.
11. It is strongly recommended that RSAT-type monitoring of streams in the study area be repeated approximately every three to five years so that changing stream conditions, related to watershed restoration efforts or to land use changes, may be better quantified.

Introduction

Over the last 16 years, the City of Rockville has made a concerted effort to address the many difficult and complex urban stormwater-related problems within its portion of the Cabin John Creek watershed. Taking a prudent step-by-step approach, the City of Rockville, Department of Public Works has, in the recent past, commissioned both engineering and ecologically-based studies of this highly urbanized watershed. Recognizing that the development of a holistic watershed management plan was needed, the Department of Public Works Stormwater Management Division (DPW) contracted the Metropolitan Washington Council of Governments (COG) to undertake such a study. As a result, a project was undertaken in 1993 with the overall goal of developing a management plan for improving water quantity, water quality, and aquatic and riparian habitat conditions in the City of Rockville portion of the Cabin John Creek watershed. Specific study objectives were as follows:

1. Thoroughly evaluate existing stream conditions within the City of Rockville's portion of the Cabin John Creek watershed using the Rapid Stream Assessment Technique (RSAT);
2. Develop a technical watershed management plan which comprehensively addresses potential stormwater retrofit, stream restoration, wetland creation and reforestation opportunities in the watershed. Priority areas included: Elwood Smith Park, Cabin John Parkway at Leverton Road, the Tower Oaks property (including the proposed Cabin John Lake site area), the former Hungerford Swim Center, the Wootton Parkway area, Old Farm Creek and Bogley Branch;
3. Evaluate both the existing Mount Vernon Place and Dawson Farm Park dry stormwater management facilities for possible wetland creation/stormwater water quality retrofit opportunities; and
4. Develop a ranking system to prioritize possible stormwater management, stream restoration, wetland creation and riparian reforestation areas identified in the study. Rankings were to include the considerations of estimated project cost and potential benefits to the watershed.

In order to accomplish the preceding objectives a four-part study was required. Part one of the study consisted of the review of previously completed stormwater management and ecological studies, as well as, available existing stormwater management facility plans for the Cabin John Creek watershed. In the second part of the study, Cabin John Creek and its tributaries were field surveyed and evaluated using the Rapid Stream Assessment Technique (RSAT). It should be noted that the RSAT survey results were crucial in the development of many of the study recommendations. Part three of the study featured: watershed land use/imperviousness evaluations, drainage basin/stormwater storage volume requirements analyses, site field investigations, analysis of expected water quality /quantity and aquatic/wildlife habitat benefits, estimated retrofit/restoration costs and recommended project prioritization. In addition,

representative concept sketches were included for proposed stormwater retrofit project sites.

For organizational purposes this watershed management plan has been divided into four chapters. Chapter one provides background information both on the RSAT method, as well as, stream survey results for the Cabin John Creek watershed. The second chapter examines stormwater retrofit opportunities. In the third chapter, potential stream restoration project sites (including recommended fish barrier removal and/or modification) are discussed. The fourth and final chapter identifies both non-stormwater wetland creation and riparian reforestation opportunities.