

Chapter 3

Assessing the Condition of Cameron Run Watershed

Developing a successful watershed plan requires accurately assessing the condition of the watershed at scales appropriate for management; therefore, the Project Team undertook a detailed assessment of the condition of the Cameron Run watershed, its subwatersheds, and constituent streams. We applied the following three approaches: (1) characterization of stream condition from field sampling of chemical, physical, and biological parameters; (2) estimation of stream processes by modeling of flow and water quality parameters; and (3) identification of specific problems through local knowledge (i.e., public involvement). This chapter describes the methods employed to assess the condition of the Cameron Run watershed.

3.1 STREAM CHARACTERIZATION

Prior to developing this watershed plan, Fairfax County completed countywide biological and physical habitat sampling. Data collected from the SPS and the SPA were the primary sources of information used in this plan for characterizing streams throughout the watershed.

3.1.1 Stream Protection Strategy (SPS)

Specifically, the purposes of the SPS program are to

- understand the degree of stream degradation and formulate measures to effectively reverse negative trends,
- identify and rank areas with the greatest needs,
- recommend streams for preservation and restoration efforts where appropriate,
- support detailed comprehensive watershed planning or stormwater master plans from which specific capital improvements may evolve,
- integrate applicable environmental policies, initiatives, and regulatory requirements,
- provide an additional information base to aid future planning efforts, and
- encourage environmental stewardship by supporting established and new citizens' programs for stream monitoring and public education (Fairfax County 2001).

In general, objectives of the program focused on defining recommendations for protecting and restoring subwatersheds by ranking areas according to priority for allocation of limited resources; establishing a framework for long-term, stream-quality monitoring; and supporting overall watershed management. Each of the SPS monitoring sites within the county was ranked according to overall quality based upon its numeric scores for the following four components of stream/watershed condition:

- the Index of Biotic Integrity (IBI), which incorporates 10 separate measures (each scored on a 0 to 10 scale) of the condition of the benthic macroinvertebrate community
- a general evaluation of the watershed features (including vegetation and instream features) and a more specific evaluation of 10 parameters of condition in streams and riparian zones, each scored on a scale of 0 (worst) to 20 (optimal)
- the richness of fish taxa (i.e., number of distinct species present)
- the overall percentage of impervious cover within the contributing drainage area of each site based upon available Fairfax County GIS data layers

The ultimate numeric score for each sampling location reflects the site's degree of departure from reference or "highest-quality" conditions. These composite values were then assigned to one of the following qualitative categories: excellent, good, fair, poor, and very poor.

The 2001 SPS Baseline Study established three broad management categories for future watershed protection and restoration efforts, based primarily on overall stream rankings of biological quality and projected development. The three management categories include Watershed Protection, Watershed Restoration Level I, and Watershed Restoration Level II. The results of this study show that the Cameron Run watershed has substantially degraded biological and habitat integrity. A summary of SPS data for Cameron Run watershed is shown in Table 2-4, and in tables and maps in Chapter 4 for each subwatershed. The Cameron Run watershed is classified as a Watershed Restoration II Area. The primary goal of this category is to maintain areas to prevent further degradation and to take active measures to improve water quality to comply with regulations.

3.1.2 Stream Physical Assessment (SPA)

The SPA study provides information about habitat conditions, specific infrastructure and problem areas, general stream characteristics, and a geomorphic classification of stream type throughout the watershed (CH2M Hill 2004). Stream assessments were performed in all county watersheds for approximately 800 stream miles.

The data were entered into a database and digitized for incorporation into a GIS-based Stream Assessment Tool. Data analysis placed stream reaches into one of five habitat assessment rating categories. Each stream reach was also placed in one of the five stages of geomorphic condition in the Channel Evolution Model (CEM), as shown in Figure 3-1.

The stream assessments comprised a habitat assessment and an inventory of physical stream features based on protocols developed specifically for this project. The habitat assessment (scoring of various habitat parameters) and the inventory (characterization of physical features such as pipelines, utilities, and buffers) together provide a baseline of overall stream conditions, from which watershed conditions can be inferred.

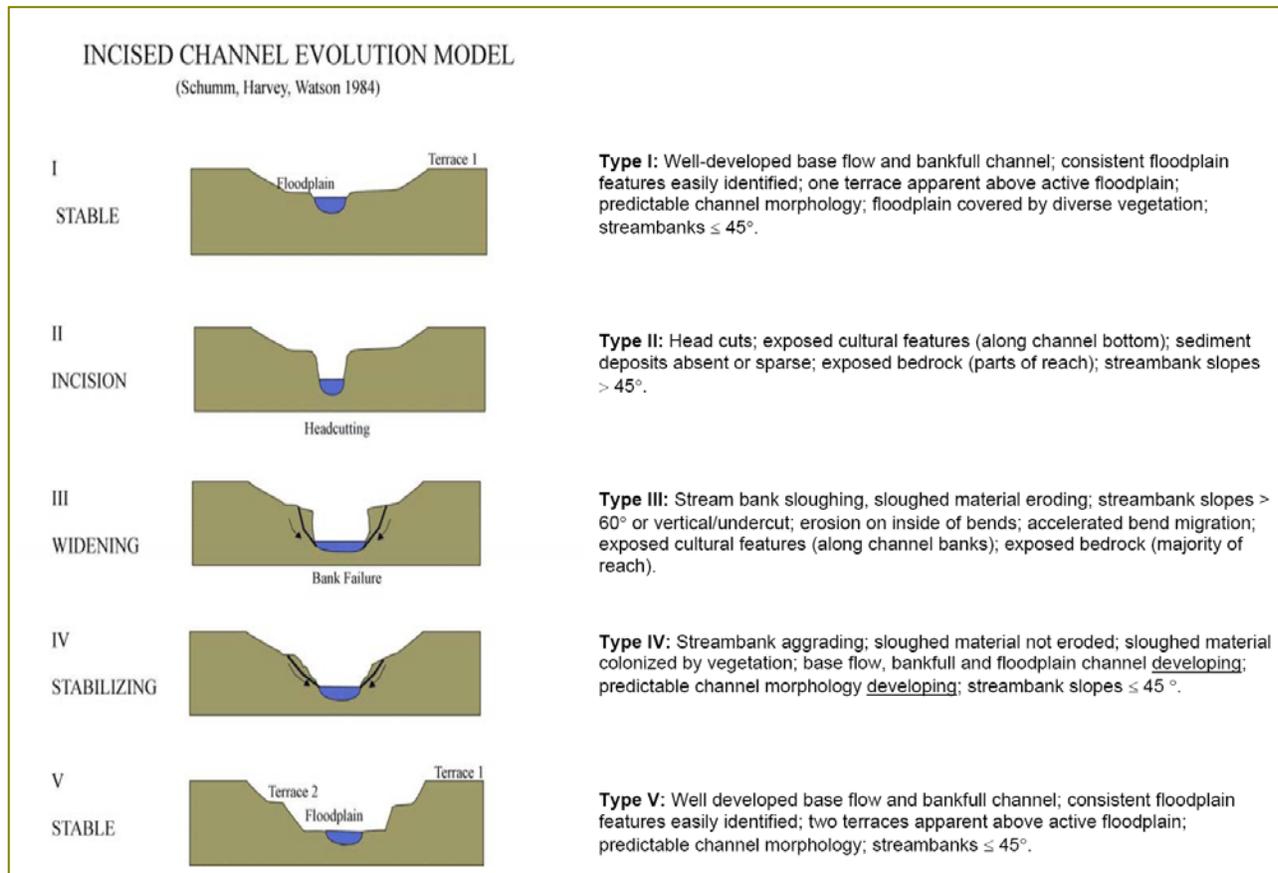


Figure 3-1. Stages in the Channel Evolution Model used in the Fairfax County SPA (CH2M Hill 2004)

Habitat assessments were performed in combination with inventory assessments for 1,523 stream reaches, totaling 720.5 miles. Inventory assessments alone were performed for an additional 304 reaches, totaling 85.7 miles. For 14 additional miles, habitat and inventory assessments could not be performed because of dangerous conditions, the presence of wetlands, and streams that were piped or channelized. The stream habitat data were used to place each stream into one of five habitat assessment rating categories: excellent, good, fair, poor, or very poor.

Based on a length-weighted habitat score of 92, Cameron Run watershed is one of the poorest in the county. Approximately 6 miles of stream were categorized as having very poor habitat conditions, 23 miles as poor, 17 miles as fair, and 2 miles as good. A summary of SPA data for Cameron Run watershed is shown in Table 2-5, and in tables and maps in Chapter 4 for each subwatershed. Analysis of the results indicates that the Cameron Run watershed has few adequate riparian buffers and more than 40 acres of deficient buffer per 10 miles.

3.2 MODELING FLOW AND WATER QUALITY

A Storm Water Management Model (SWMM) was developed for the Cameron Run watershed; the model included all of the watershed areas in Fairfax County, Falls Church, and Alexandria, upstream of the USGS gauge on Cameron Run. The purpose of the model is to represent base-

year and future conditions in the watershed, including imperviousness and land use, from which it simulates rainfall-runoff hydrology and water quality. The Hydrologic Engineering Center River Analysis System (HEC-RAS) hydraulic model was developed to simulate 1-, 2-, 10-, 25-, and 100-year design storms. HEC-RAS is used to evaluate road crossing overtopping, structure flooding, analysis of bankfull capacity, and erosion velocities for selected design storms. The full model report is included as Appendix B.

The Cameron Run watershed was divided into 8 subwatersheds and 155 subbasins. The total area in the delineated watershed equals 44.4 square miles, of which 33.9 square miles are upstream of the USGS gauge on Cameron Run in Alexandria. The subbasins range in size from 100 to 290 acres and average 183 acres. Impervious area for the watershed was delineated from Fairfax County's GIS coverages of buildings, roads, and parking lots; SWMM also used Fairfax County's GIS land use coverages to evaluate base-year and future conditions within the watershed. Existing and future stormwater management facilities were simulated with SWMM within the Fairfax County portion of the watershed. The storage and outflow relationships for the facilities in each subbasin were simulated so that peak flows under base year-conditions and future land use were equal to the peak flows for the 2-year and 10-year design storms for undeveloped conditions.

SWMM was used to evaluate the influence of base-year and future development within the watershed on flow rates, velocity, and water quality. Increased flows, velocity, and pollutant loadings were assessed for each of the subwatersheds as well as the entire watershed; summary results are provided in Chapter 4 by subwatershed. For each subwatershed, reported pollutant-loading values are the area-weighted averages of all the subbasins in each subwatershed. Values for peak flow and pollutant loading rates under base-year and future conditions for the eight subwatershed areas are provided in Chapter 4, including the percent increase for each value.

3.3 PUBLIC INVOLVEMENT

The third critical source of information about the condition of the Cameron Run watershed was local knowledge obtained through public involvement. The Project Team solicited information in two ways: (1) frequent meetings with an Advisory Committee representative of major stakeholders in the watershed, and (2) outreach through public meetings and information exchange via the Cameron Run watershed web site.

3.3.1 Advisory Committee

Advisory Committee (AC) meetings were held 13 times. Dates and locations of the meetings held to date are listed below.

- November 20, 2003 John Marshall Library, Alexandria, Virginia
- December 16, 2003 Woodrow Wilson Public Library, Falls Church, Virginia
- January 13, 2004 Woodrow Wilson Public Library, Falls Church, Virginia
- February 12, 2004 Ellen Coolidge Burke Branch Library, Alexandria, Virginia

- April 1, 2004 Richard Byrd Branch Library, Springfield, Virginia
- April 28, 2004 Mason District Government Center, Annandale, Virginia
- May 26, 2004 George Mason Regional Library, Annandale, Virginia
- August 25, 2004 Mason District Government Center, Annandale, Virginia
- September 20, 2004 Mason District Government Center, Annandale, Virginia
- November 10, 2004 Versar Headquarters, Springfield, Virginia
- January 12, 2005 Woodrow Wilson Public Library, Falls Church, Virginia
- April 7, 2005 Woodrow Wilson Public Library, Falls Church, Virginia
- June 8, 2006 Mason District Government Center, Annandale, Virginia

Minutes from these meetings are included as Appendix C. AC members and their affiliations are listed in the acknowledgments section of this plan. Problems identified by the AC are outlined in Chapter 4.

3.3.2 Public Outreach

Four public meetings were scheduled as part of the process of developing the watershed plan. Dates of public meetings and scopes of each are listed below.

- Public Issues Scoping Forum - June 17, 2004, Mason District Government Center, Annandale, VA
This meeting provided a brief introduction to the watershed planning process, answered questions, and discussed specific issues of concern in break-out groups. Ways to increase public involvement were solicited.
- Community Watershed Forum - October 23, 2004, Holmes Middle School, Alexandria, VA
This forum presented watershed analysis results and discussed alternative approaches to solving watershed problems.
- Draft Watershed Plan Forum - June 16, 2005, Mason District Government Center, Annandale, VA
The forum briefly introduced the watershed planning process and summarized the Cameron Run watershed plan. Break-out groups reviewed and discussed the programmatic recommendations and projects selected for each subwatershed in the draft plan.
- Final Watershed Plan Forum - December 4, 2006, Mason District Government Center, Annandale, VA

The final forum reviewed the watershed planning process and the groups involved in developing the plan and summarized the Cameron Run watershed plan, including the next steps involved in finalizing the plan. Break-out groups reviewed and discussed Tier 1 Projects, Group 1 Drainage Complaint Projects, and Policy Recommendations included in the Draft Final Cameron Run Watershed Plan.

The Project Team also provided comprehensive information about the Cameron Run watershed planning process to the public via the county's website at <http://www.fairfaxcounty-watersheds.net/htmls/public/watershed.aspx?indx=11> (Figure 3-2). Information on the web site includes the following:

- Profile of Cameron Run
- Land Use Classification
- Current Announcements
- Current Event Calendar
- Watershed Documents
- Steering Committee
- Relevant Links



Figure 3-2. Cameron Run watershed web site