3 Study Methods and Approach

In March 2012, EA developed a work plan for the study efforts to be conducted as part of this watershed evaluation. The elements of that work plan are briefly described below, and the results of this study are presented in Section 6.

3.1 Review of Existing WSSC Reports and Recreational User Program

EA and Chesapeake Environmental Management (CEM), referred to as the Study Team, reviewed and assessed the following existing information from WSSC.

- Forest Conservation Plan for Washington Suburban Sanitary Commission Reservoir Properties (MDNR 2007)
- Patuxent Reservoirs Interim Watershed Management Report (Versar 2009)
- The Patuxent Reservoirs Watershed Protection Group's (2011) Annual Report
- WSSC's Watershed Recreational User Program (http://www.wsscwater.com/home/jsp/content/wrup.faces)

3.2 Stakeholder Meetings

In cooperation with WSSC, EA conducted two public stakeholder meetings. Separate meetings were conducted for stakeholders of the Rocky Gorge Reservoir (18 June at the Laurel Boys and Girls Club) and the Triadelphia Reservoir (19 June at the Izaak Walton League Wildlife Achievement Center). Stakeholders could attend and speak at either or both of these venues. The purpose of the stakeholder meetings was to:

- present an overview of the study work plan,
- answer questions about the study, and
- listen to and record stakeholder comments and suggestions regarding recreational use of the WSSC-owned lands adjacent to Rocky Gorge and Triadelphia reservoirs and potential impacts to reservoir water quality.

Approximately three weeks prior to the public stakeholder meetings, WSSC placed advertisements in 3 local newspapers and posted news releases on WSSC's website and in community calendars. In addition, WSSC provided EA with several community mailing lists, and email addresses of permit holders that obtained their permits online (https://secure.wsscwater.com/home/jsp/content/wrup.faces). EA sent over 3,500 mailed and 350 e-mail meeting notices to all stakeholders identified in the sources provided by WSSC.

Stakeholders were invited to submit written comments within a 30-day comment period that ended on July 19, 2012.

3.3 Desktop Analysis of Erosion Potential

The Study Team conducted a desktop mapping study of highly erodible soils (HES) surrounding the Patuxent Reservoirs using a Geographic Information System (GIS). The objective of the GIS assessment was to perform a "desktop analysis" to identify soils within the reservoir buffer

property that may be susceptible to erosion. GIS soil type data were obtained from the Soil Survey Geographic Database (SSURGO) for Howard, Montgomery, and Prince George's Counties, Maryland, available from the USDA's Natural Resources Conservation Service (NRCS) Soil Data Mart (Soil Survey Staff 2012). It is important to the note that HES does not represent actual erosion, but merely soils that have a higher potential for erosion. It is possible to have a well-designed trail on HES soil that will not erode, and likewise it is possible for a poorly designed trail on non-HES soil to erode.

The NRCS has developed HES lists separately for each county but they all use a consistent definition of HES based on the COMAR 27.01.01.01 criteria defined as soils with an erodibility factor (Kw) greater than 0.35 and with a slope greater than 5%, or soils with slope greater than 15% (COMAR 2012). The soil erodibility factor Kw represents a soil's inherent susceptibility to erosion, and is experimentally measured as the rate of soil detachment by runoff and raindrop impact (USDA 2012). Factors that affect Kw include soil texture, organic matter content, structure size class, and the saturated hydraulic conductivity of the subsoil (USDA 2012). The Kw does not include other factors that contribute to erosion of roads and trails, such as alignment and types of use (vehicle, horseback riding, etc.).

The HES soil types for Prince George's County were obtained online from the Prince George's County Soil Conservation District (Prince George's County Soil Conservation District 2009). The HES lists for Howard County and Montgomery County were obtained from NRCS. The lists of the HES for each county are presented in Appendix A. Soils marked as UaF (Udorthents, Highway, 0 to 65% slopes) were removed from the mapping, because they correspond to major highways (e.g., Route 29). The HES soils layer was clipped by the trails layer to determine the portion of the buffer property trails that cross HES areas.

High-resolution digital elevation data (1/9 arc-second or approximately 3 meter grid cells) were downloaded from the U.S. Geological Survey's (USGS) National Map Viewer (USGS 2012) in order to examine slope and trail alignment.

3.4 Field Survey of Public Access Areas, Accessible Interior Trails, and WSSC Access Roads

The Study Team conducted a reconnaissance-level survey of the public access areas, authorized recreation trails, and unauthorized trails within the WSSC-owned buffer property of the Triadelphia and Rocky Gorge reservoirs. The objectives of the survey were to:

1. document the condition and suitability of public access points,
2. record global position system (GPS) coordinates of existing public access trails, accessible interior trails, and the WSSC Access Roads,
3. determine the proximity of the trails to the reservoir, and
4. photo-document sections of the recreation trails and WSSC Access Roads with existing erosion, high erosion potential, or water quality impacts (e.g., trash, animal waste, etc.).

The recreation area survey documented features of the recreation areas, including types of permitted recreational uses, available parking, restroom facilities, drainage stabilization criteria,

and potential water quality impacts. The objectives of the public access point survey were to record features related to types of use (picnicking, boating, fishing, and equestrian) and level of use.

The procedure used to evaluate the erosion conditions of the recreation trails and WSSC Access Roads was based on recommendations presented in *Research for the Development of Best Management Practices to Minimized Horse Trail Impacts on the Hoosier National Forest* by U.S. Forest Service and Virginia Tech (March 2005), but adapted for a reconnaissance-level survey due to the time and budget constraints of this study. Trails were mapped on foot or where possible from a 4WD truck. GPS coordinates were recorded using a Garmin® GPSMap 62stc handheld GPS receiver. Locations of the trail with visually obvious signs of erosion, features contributing to a high erosion potential (i.e., steep slope, steep alignment, bare soil or gravel), or water quality impacts were photo-documented. During the trail survey, observations of conditions or practices of neighboring properties that have the potential to adversely impact erosion or water quality were also photo-documented.

Areas of observed trail erosion were characterized as follows:

- High: Area of impact exceeding approximately 50 square feet,
- Medium: Areas of impact of approximately 20 to 50 square feet, and
- Low: Areas of impact of less than 20 square feet.

For all sections of trail designated as impacted, a GPS waypoint and geotagged photograph was recorded for reference.

3.5 Reconnaissance-Level Survey of the WSSC Equestrian Trail

A reconnaissance-level survey was conducted by the EA Team on 4 June 2012 to evaluate the suitability for horseback riding on the 10.1 mile section of the Rocky Gorge Access Road (Montgomery and Prince George's Counties) that is designated by WSSC as the equestrian trail (Appendix B). The survey was conducted by an EA environmental scientist with over 40 years of horse riding experience. The survey was conducted in 4-wheel drive vehicle (where access allowed) and on foot. All sections of the Rocky Gorge Access Road equestrian trail surveyed were evaluated for their suitability for horseback riding, with consideration given to slope, footing, trail clearance, stream crossings, and other potential obstacles or hazards. Observations of trail condition were also made, and areas of extreme erosion or other notable trail conditions were photo-documented. The equestrian trail was evaluated for slope and footing. Reasonable footing for a horse is a natural surface consisting of hard packed earth. A trail road base with crumbling subsoil, loose gravel or cobble-size rocks was considered poor footing for horses. Trail slopes were classified as

- Gentle (<5 degree slope)
- Moderate (5 – 15 degree slope)
- Steep (15 to 25% slope)
- Very Steep (> 25 degree slope).

The survey used a rating scale of 0-5 to generally describe the condition of each trail section. The rating scale (Table 3-1) was developed by EA specifically for the purpose of assessing WSSC trail suitability for horse riding.

TABLE 3-1 RATING SCALE TO ASSESS SUITABILITY OF TRAILS FOR HORSEBACK RIDING

Rating	Description of Prevailing Conditions
5	Excellent horseback riding trail. Terrain flat or moderately rolling. Footing conditions firm and free from loose rocks, deep footing or other impediments. Stream crossings easy with gentle slopes, good footing and no obstacles.
4	Very good horseback riding trail. Terrain moderately rolling with some steeper areas. Footing mostly good, with some areas of loose rock or "deep" footing. Stream crossings moderately easy, with steeper banks, or some obstacles such as rocks, roots or ledges to navigate.
3	Moderate horseback riding trail. Terrain hilly, with several steeper areas to be negotiated. Footing variable, with a mix of good footing interspersed with areas of moderate to poor footing due to rocks, ledges, roots, or bogs. Stream crossings ranging from moderate to difficult with steep ascents, and rocky or deep footing. Some obstacles such as rocks, roots, ledges.
2	Poor horseback riding trial. Significant stretches of steep terrain. Footing poor with an abundance of loose rock, steps, downed trees or logs. Stream crossing difficult with very steep ascents, ledges or drops and rocky or deep footing. Serious obstacles at crossing such as large rocks/boulders, trees or logs, deep gullies or areas of erosion, concrete railroad ties.
1	Unsuitable or potentially unsafe riding trail. Significant stretches of very steep terrain. Very poor footing with significant amounts of loose rock, erosion, gullies, loose soil, deep bogs, downed trees. Stream crossings washed out or impassable.
0	Impassable riding trail. Potentially dangerous conditions over which a horse could not safely travel. Impassable conditions could be caused by extremely steep terrain, extremely poor footing, or impassable stream crossings or obstacles. Risk of injury to horse or rider is high.